

Consulting Engineer

August 1959

ADOLPH J. ACKERMAN, consulting engineer, of Madison, Wisconsin, believes that every engineer owes some of his time to the education and encouragement of the next generation of the profession. Ackerman, who has been interested in education since he planned his own rather unorthodox training program, has put his theories into practice. In recent years he has taken time from a busy professional career to serve as chairman of the

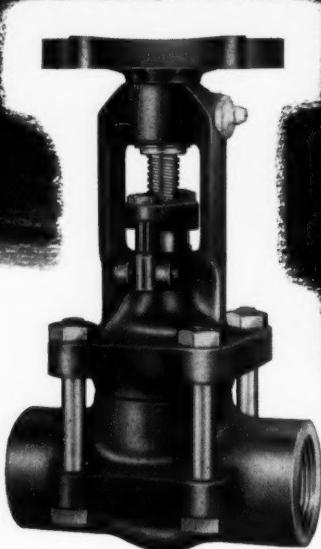
Continued on Page 12



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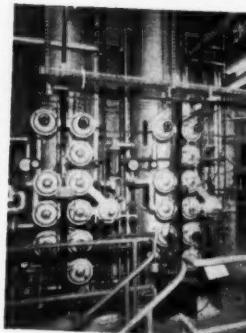
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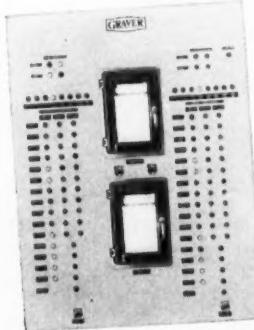


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ARTICLES

- 86 An Economic Investigation...The Gas Turbine-Steam Turbine Cycle
I. Gabel
- 92 How We Air Condition Europe's Skyscrapers
Oreste Jelo and Piero Palatresi
- 96 Europe - 1959 - Engines, Engineers, and Enterprise
Hunter R. Hughes
- 104 Who Does What?
Milton Tucker
- 108 Specifications - Who Writes Them; How They Are Written
A Committee of One-Hundred Report
- 113 Forrest and Cotton Decorate a Downtown Engineering Office
Lucile Ayres Payne
- 116 We Need a New Service Voltage
A. S. Anderson

DEPARTMENTS

- Cover Personality - Adolph J. Ackerman
28 From the Editor's Tranquil Tower
34 Readers' Guide
37 Readers' Comment
46 Report from the West Coast
59 Heard Around Headquarters
71 The Legal Aspect
79 The Word from Washington
119 Krick Weather Forecast
127 Atoms in Action
138 Field Notes
157 News for the Consultant
172 Men in Engineering
184 Books
202 New Projects Reported
226 Consulting Engineers' Calendar
228 Advertisers' Index

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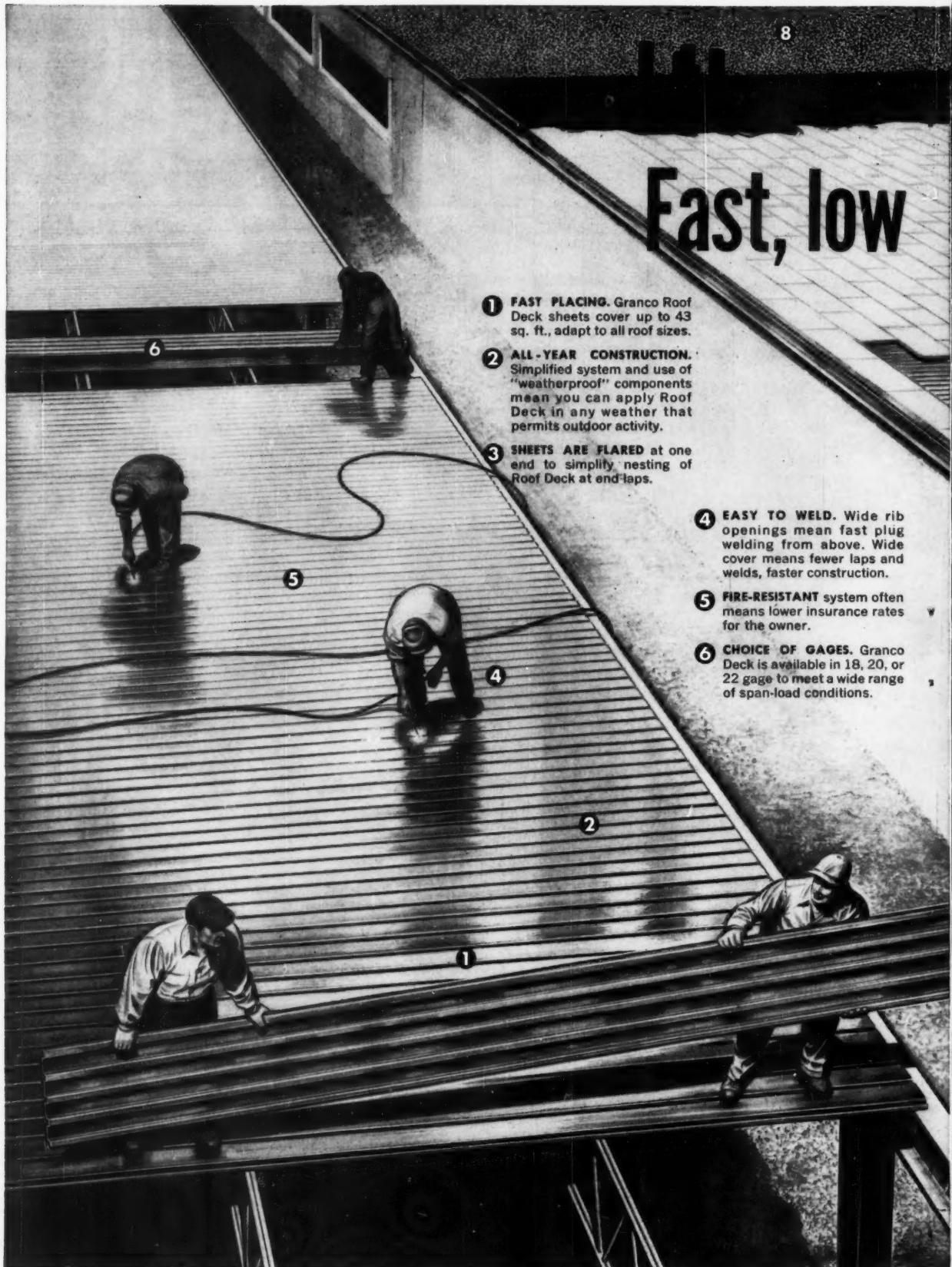
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CONSULTING ENGINEER is published monthly by Consulting Engineer Publishing Company at 217 Wayne Street, Saint Joseph, Michigan. Price 1 year \$10.00; foreign \$15.00; single copy \$1.00. Accepted as Controlled Circulation Publication at Saint Joseph, Michigan. Copyright 1959, Consulting Engineer Publishing Company.



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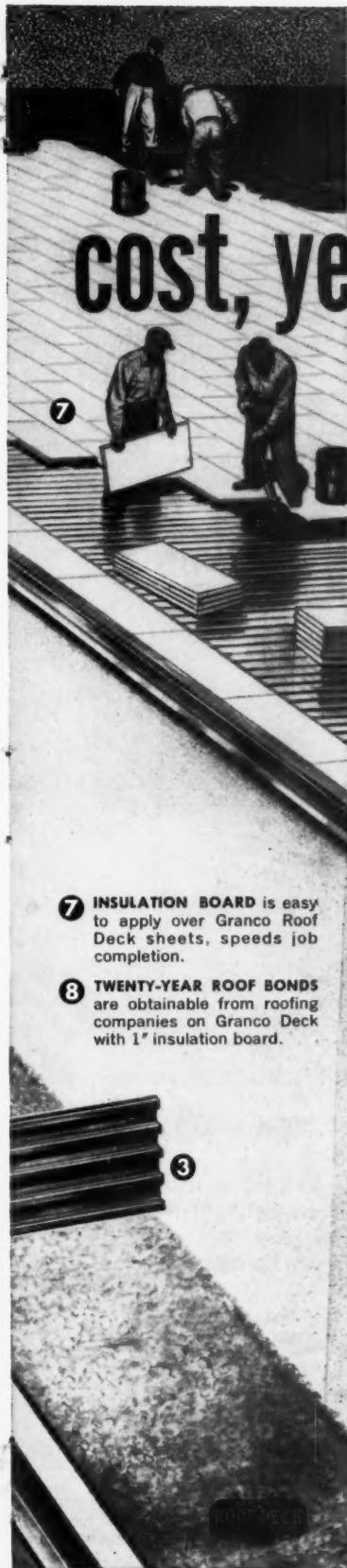
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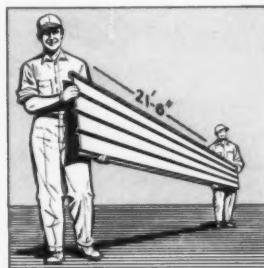
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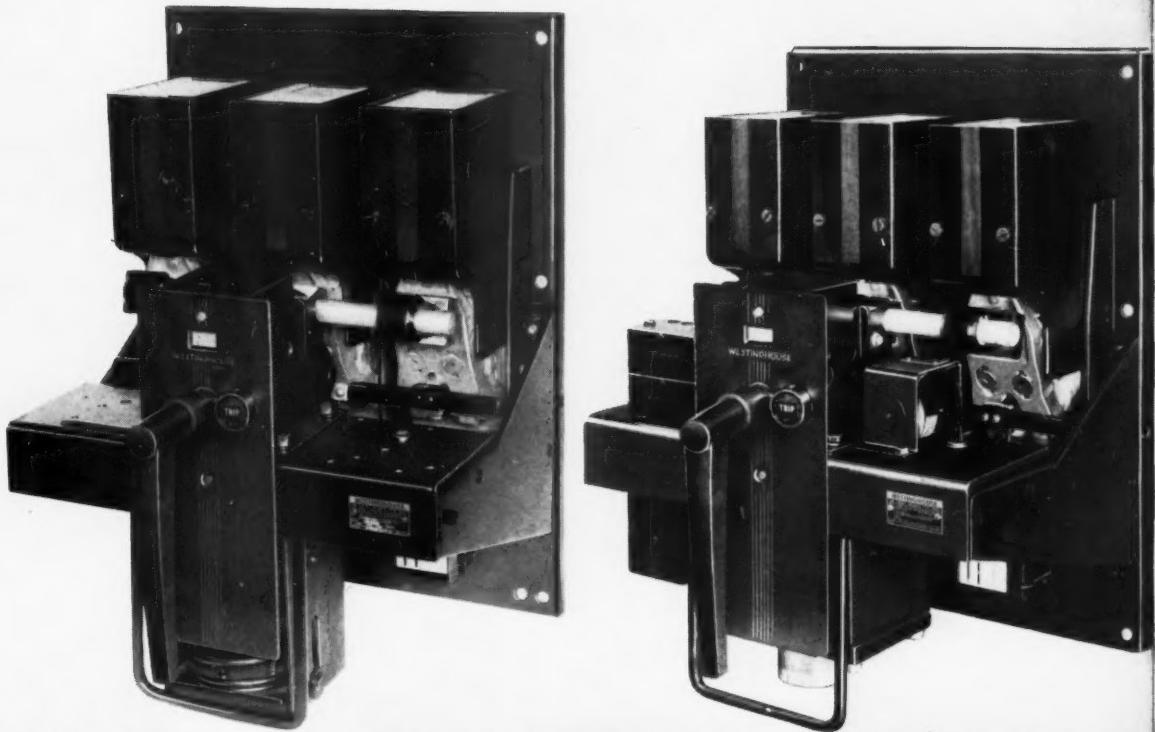
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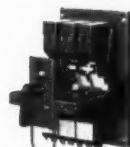
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spring-manual closing

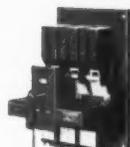
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you need**



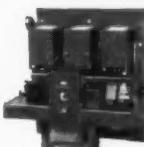
Type DB-15



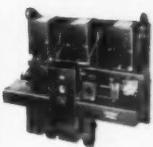
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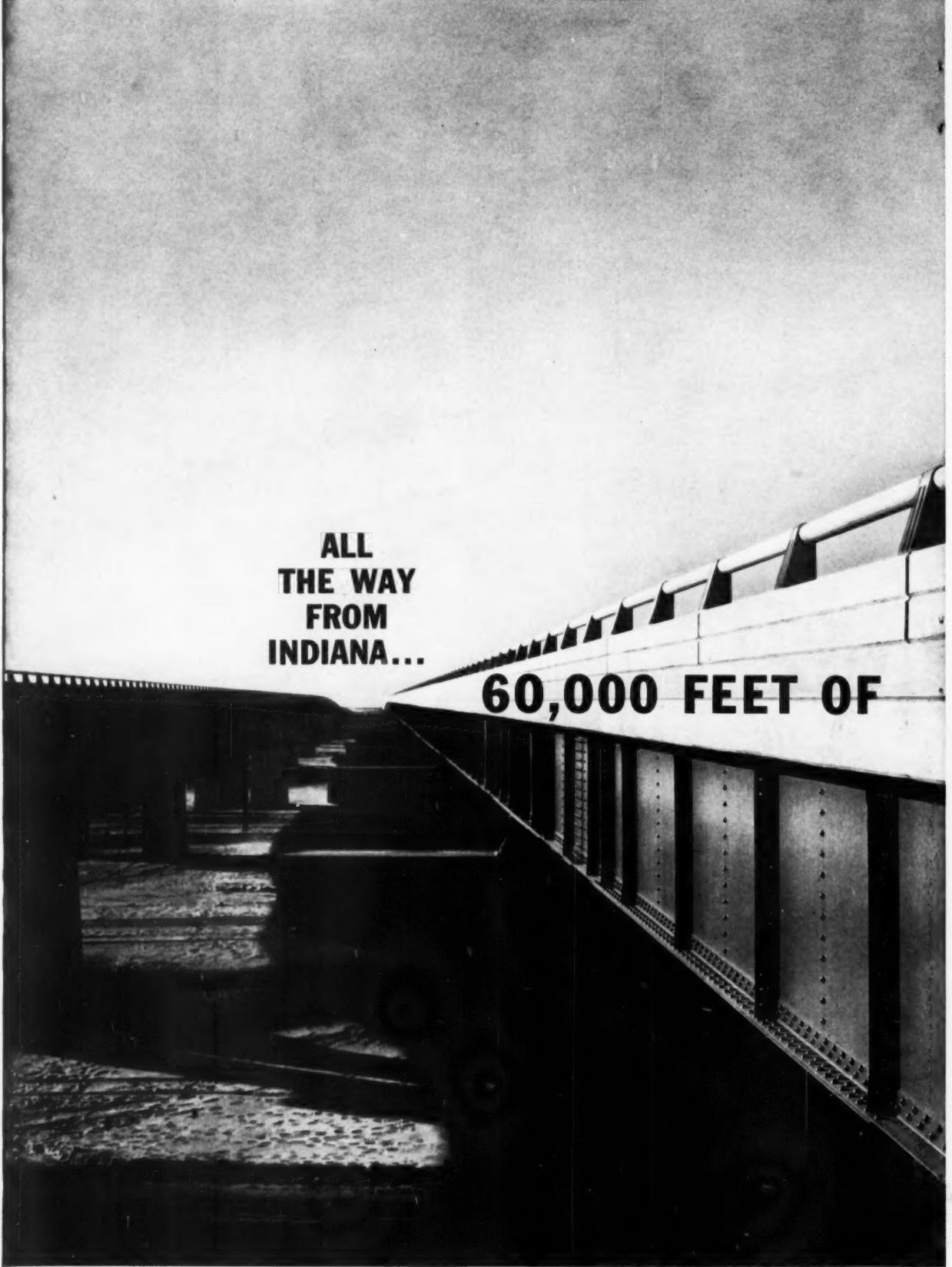
For Fixed Position Mtg.	For 3-Poz. Drawout Mtg.
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Electric Solenoid
Closing

For Fixed Position Mtg.	For 3-Poz. Drawout Mtg.
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THE WAY
FROM
INDIANA...**

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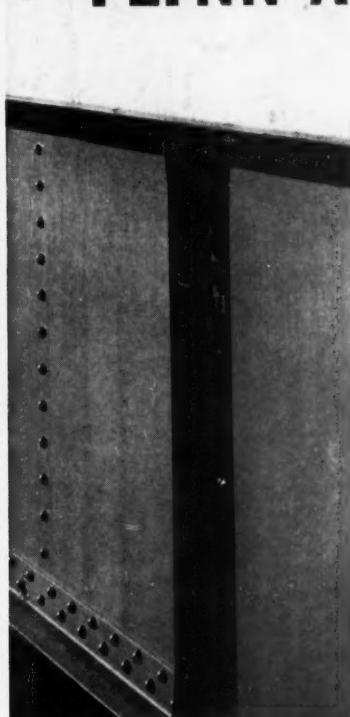


Flynn aluminum post-and-rail combinations were used for more than 60,000 rail-feet of bridge, overpasses, and approaches on the Northern Illinois Toll Highway. Starting at the Indiana border, it stretches for 187 miles.

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This single-rail installation with Flynn CP-191 standard cast posts, is part of the 60,000 rail-feet of post-and-rail combinations supplied and installed on the Northern Illinois Toll Highway by Michael Flynn Manufacturing Company. Chief Engineer: George L. Jackson, Consulting Engineers: Joseph K. Knoerle and Associates, Inc. Photograph: Hedrich Blessing.

Adolph J. Ackerman

- Starts on front cover

American Society of Civil Engineers' Task Committee on Professional Education, as a Visiting Professor of Professional Practice at the University of Illinois, and as a lecturer at various other universities in this country and in India.

"Colleges today are turning out technicians, not engineers," Ackerman states. His solution? He is a strong advocate of the five year engineering degree with the additional time devoted to the humanities. "Technical subjects already are being covered extensively. But the young engineer should have a sound background in such subjects as American government, economics, finance, and fundamentals of the free enterprise system, before he leaves college."

The son of a Lutheran minister, Ackerman was scheduled to follow his father's profession during his preparatory academy days at Martin Luther College, in his home town of New Ulm, Minnesota. Finally, reacting to the intensive study of old languages, Ackerman broke the news to his father that he did not want to be a minister. His father eventually agreed to a change, on condition that the boy take up a "respectable profession." The elder Ackerman approved of engineering, as he did his son's later marriage to the daughter of the deacon in his new Mankato, Minnesota, church.

Since electricity was the popular topic of 1915, young Ackerman took a job as an office boy and clerk with an electrical wholesaler in St. Paul before going to college. He still is a strong advocate of work experience before college.

While in St. Paul, young Ackerman heard of an "earn while you learn" program in Milwaukee. He enrolled shortly after World War I in the privately operated electrical engineering school sponsoring the program. Because of his experience, Ackerman had no trouble arranging for work with a Milwaukee electrical wholesaler.

After two years of this, Ackerman transferred to the University of Wisconsin, in Madison, where he was given full credit for his studies in Milwaukee. At the University he became interested in hydraulics through required courses in the subject and also through listening to Daniel W. Mead (consulting hydraulic engineer and later an ASCE president), who taught two mornings a week. "He was an inspiring lecturer, and his practical experience stimulated quite a number of students to enter the broader fields of engineering," Ackerman added. He has always remembered Mead's example, and has managed to work a certain number of college lectures into his busy schedule.

Concluding his junior year at the University, Ackerman arranged for job interviews with the seniors in order to gather advice on what subjects he should study during his senior year. "I found that most industries had two-year training programs after graduation. I recognized the need for training in industry, but it seemed to me that it was terribly important to make a basic choice of technical interests and to embark on a career, with the implication of long-range commitments, before having some 'trial period' of employment."

So Ackerman decided to take his student training before, rather than after, graduation. He, along with about 25 graduates from various schools went to work on the Consumer's Power Company Alcona Dam project on the Au Sable River, in Michigan. Some of them were to work only for the summer, while others, like Ackerman, agreed to stay for the duration of the project.

The job superintendent had been told that when the boys came he was to put them to work, and he did just that. Their first job was digging trenches in quicksand. "Our first experience in soil mechanics, I suppose. We didn't have to push the shovel down, but it was really hard to pull it out," Ackerman said. The youths also were given other jobs, such as bending steel reinforcing rods. "I think it is a great loss to students of today if they do not go out and actually learn what is done on a project by actual labor, from digging ditches on up. Where present day union regulations prevent this, special permits can frequently be arranged."

Because he had arranged to get university credit for a thesis describing his work in Michigan, Ackerman kept a full pictorial and written report. This has become a habit he has continued throughout his career. "After all, it is the details you forget. And on similar problems in the future, it is the details that are important." His experience at Alcona turned out to be so valuable that Hershel Tuley, a resident engineer with Fargo Engineering Company, offered Ackerman the position of principal assistant on another job, so he stayed on for a second year at Hodenpyl Dam. Ackerman then returned to his senior year at the University and was awarded his degree in Electrical Engineering.

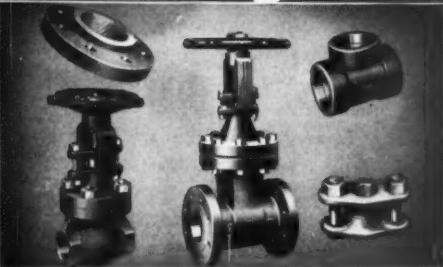
Having his "practical internship" now behind him, Ackerman was at an advantage in looking for a job. He had no trouble becoming a hydraulic designer on Stone & Webster's \$52-million Conowingo Dam, in Pennsylvania. "I had experience on two earthfill dams, and now I wanted to take part in the design of a concrete dam. This one was the largest in the country at that time, and I visited the construction site several times."

While happily working at Stone & Webster, Ackerman received a letter from the former chief de-

Vogt

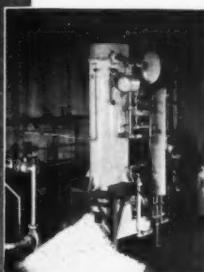
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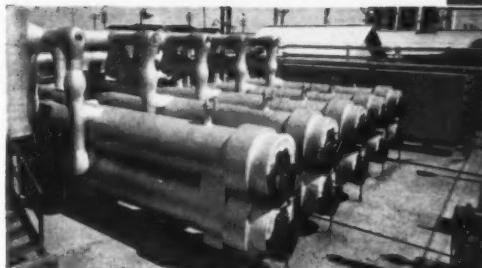
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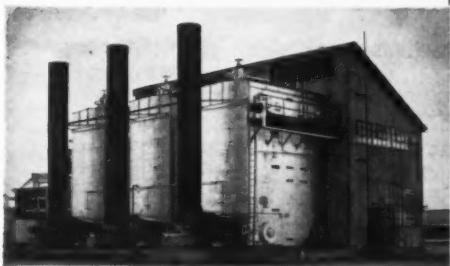
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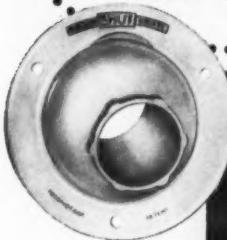
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sign engineer of the Michigan projects, who was now located in Pittsburgh with the Aluminum Company of America. He described the company's new hydroelectric program and urged Ackerman to write to the chief hydraulic engineer. Not being too keen about moving at the time, Ackerman nevertheless responded to the suggestion. "I thought I took care of the situation by asking for a salary which I considered too high to receive further consideration. To my surprise I received a telegram telling me to report.

"I was very fortunate," Ackerman recalled. "I came under the tutelage of James W. Rickey, Alcoa's chief hydraulic engineer. He was an original thinker who always avoided repetition if it was merely the easy way out of a design problem. He and his assistant chief, James P. Growdon, demanded both skillful and economical solutions to every problem."

Alcoa had several large hydroelectric projects under way, including the \$20-million Calderwood arch dam across the Little Tennessee River, near Knoxville. For this project Ackerman had the assignment of designing the complete spillway gate and hoisting equipment. He obtained a patent on his designs. Ackerman's mechanical equipment permitted the operation of the entire system of 24 floodgates by one man.

During this same period, Alcoa was building the \$30-million Chute-a-Caron dam, on the Saguenay River in Quebec, as part of the newly formed Aluminum Company of Canada. One of the most serious problems was to find a way to divert the swift Saguenay River during the construction period. With a solid granite river bed, there was no way to anchor the usual type of crib coffer dam. Rickey had casually suggested building a massive concrete diversion dam on end on the right bank and tipping it into the river. He called it an "obelisk." Ackerman was given the assignment of studying this problem on a model which he built at the Carnegie Institute of Technology. On the big day, when the 11,000-ton obelisk was tipped across the 100-ft stream, it created the world's biggest splash. "It was a great privilege for a young engineer to be associated with this example of original engineering."

The time was now 1930, one year after the stock market crash, and Rickey called Ackerman in for a talk. "I guess he relied on my lack of appreciation of the seriousness of the economic situation, so I was one of the first to go." Rickey kept the men with more serious family problems as long as possible, but eventually the entire department was closed down.

Only two major dams were scheduled for construction at that time, Hoover Dam and Madden

Dam. The latter was a \$10-million storage project to provide additional water for the operation of the Panama Canal. Since Ackerman knew most hydro engineers were trying to get work on the Hoover Dam, he decided the other project would be the most likely to need someone.

After hearing that W. E. Callahan Construction Company, of St. Louis, had been awarded the contract, Ackerman made a trip to that city in an effort to convince Callahan's that he had just the right kind of experience for them. It worked, and Ackerman was soon on his way to Panama, as chief engineer for the contractors.

As the Madden Dam neared completion, Ackerman continued his technical writing with an article titled "Concreting Plant for Madden Dam." As a result, he was offered the opportunity to design the construction plant for a dam which was larger but very similar to Madden Dam. The new position was with the newly formed TVA, which was planning the \$35-million Norris Dam, in Tennessee. The chairman, Arthur E. Morgan, and the superintendent, Ross White, had read Ackerman's article, and they hired him on that basis.

Ackerman's work on the mechanized construction processes for this large gravity dam, and for four other dams to follow, were described in a number of technical papers which later were put into his first book, *Construction Planning and Plant*.

Returns to Industry

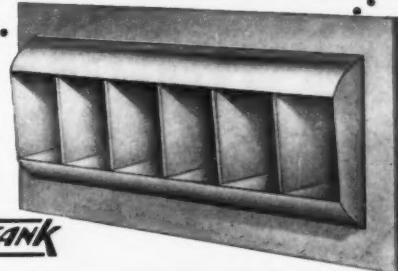
In addition to holding the position of head construction plant engineer, Ackerman also served as special assistant to the chief engineer until 1937, when he found an opportunity to return to private industry as director of engineering for Dravo Corporation, in Pittsburgh.

He worked on the firm's contracts for dams, tunnels, navigation locks, drydocks, large cranes, towboats, and other projects. Then, when World War II was declared, Dravo speedily entered the war program. Ackerman was given the additional duties of director of plant expansion in charge of designing and building two large temporary shipyards in Pittsburgh and Wilmington. Each of these yards, designed to build ships for the U.S. Navy on a side launching "conveyor-belt system," had a launching a week.

Dravo was the "lead" shipyard commissioned to build LST's and to coordinate their building by others. A total of over 1000 LST's were produced in about 10 shipyards within a two-year period, and Dravo alone built 150 of them. Ackerman was awarded a special certificate "For outstanding service to the U.S. Navy during World War II."

As the end of the war was approaching, somebody in Washington inquired about the possibili-

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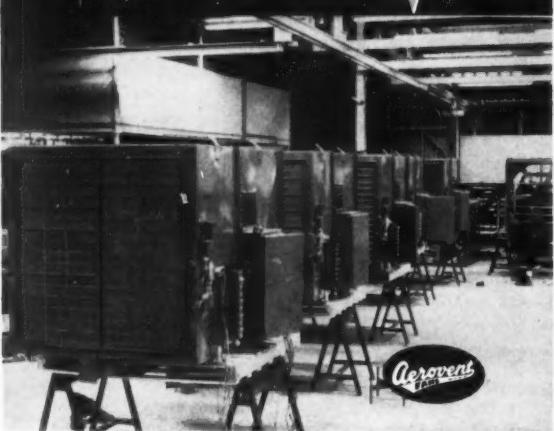
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ties of using some of the LST's after the war on the rivers of South America, since they would be able to go inland and unload cargo without dock facilities. Ackerman and a barge line manager were assigned to inspect every major river in South America. They traveled all the way up the Amazon and over the Andes by sea plane, but they found no future for the LST. "It could land inland, but there was no population that could be served economically by the service."

While in South America, Ackerman visited A.W.K. Billings, the man credited with the fantastic growth of Rio de Janeiro and Sao Paulo through production of hydroelectric power for these cities and the surrounding region.

Ackerman had been back in the United States only a short time when he received an invitation to visit Billings in New York City. There he was invited to take over Billings' job as chief of engineering and construction for the Sao Paulo and Rio de Janeiro Tramway Light & Power Companies. The job was vacant because Billings had been requested by his directors to succeed the company's president, who had died a short time before.

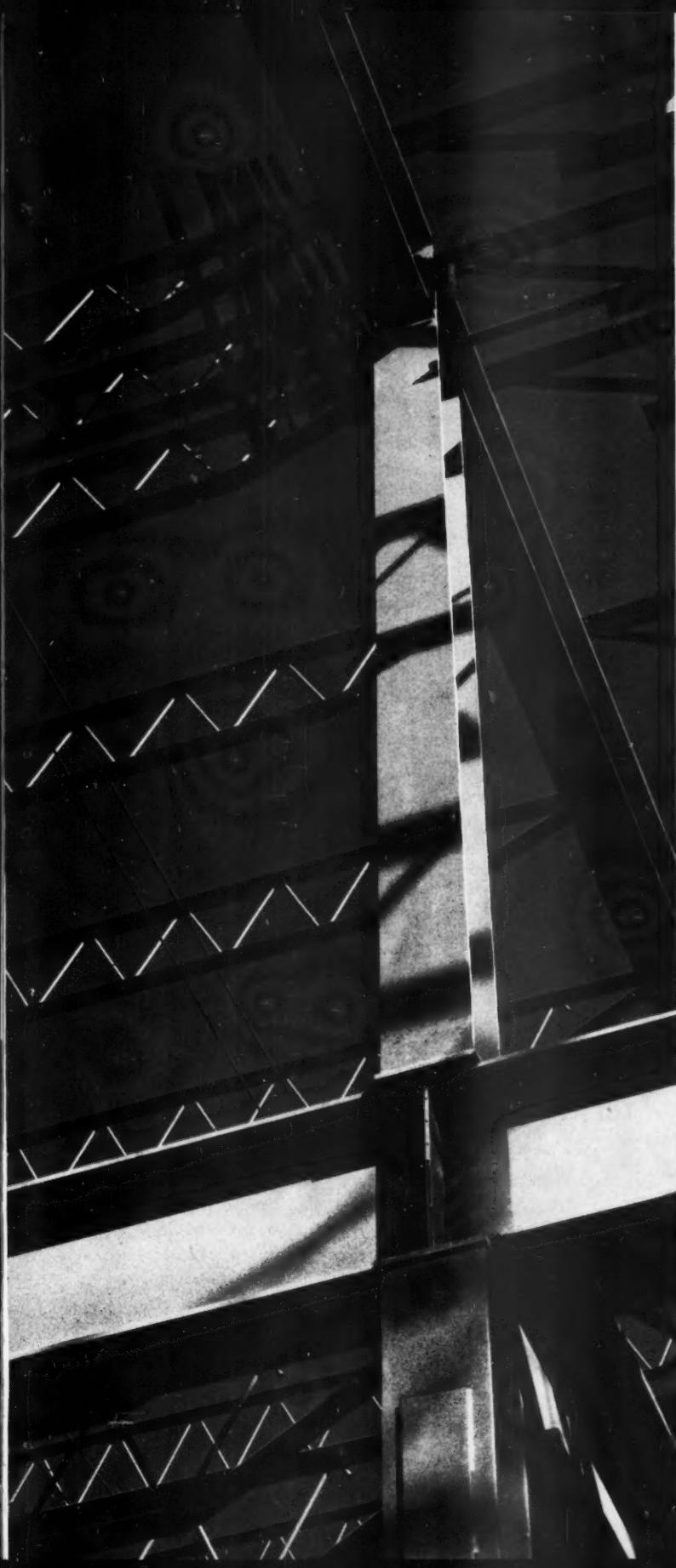
Brazil was on the threshold of a large postwar power program, and between 1945 and 1951, Ackerman directed the design and construction of a \$200-million hydro power program, with an ultimate installed capacity of 1,530,000 hp.

Among his outstanding projects at this time were the Paraiba-Pirai Diversion Project and two underground power stations, the first of any size to be built in the Western hemisphere. These designs were completed after extensive studies of similar power stations in Switzerland and Sweden.

Why did he decide to put the power facilities underground? According to an ASCE paper he co-authored, these underground installations are more economical than outdoor extensions because of lower penstock costs, the elimination of danger from earth and rock slides, and because removal of an existing plant was avoided so that it could be retained indefinitely for standby operation.

Ackerman left Brazil when it became evident that foreign financing could not be arranged for the next major program he had laid out. Since then, portions of it have been built by the staff which he had developed during the 1945-51 program. He retained a great admiration for Billings, and later wrote the book *Billings and Water Power in Brazil* (published by ASCE, 1953). It recorded an outstanding story of an American engineer's achievements in another country.

Upon his return to the United States, Ackerman decided to go into private practice. The question was, where? He remembered how well he had liked Madison, Wisconsin, when he was attending



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the University. Soon after, he bought a home on Lake Mendota.

In 1953, Ackerman was asked to return to Brazil to make a comprehensive study of its power facilities and future needs for the Brazil-U.S. Joint Commission. His findings were later presented in a paper to the World Power Conference in Rio de Janeiro in 1954.

In recent years he has made special investigations and reports on hydroelectric potentialities and on new projects in Peru, Chile, Panama, Cuba, Venezuela, Uruguay, India, Canada, Puerto Rico, Mexico, and the Dominican Republic, as well as special reports for other consulting firms and banks.

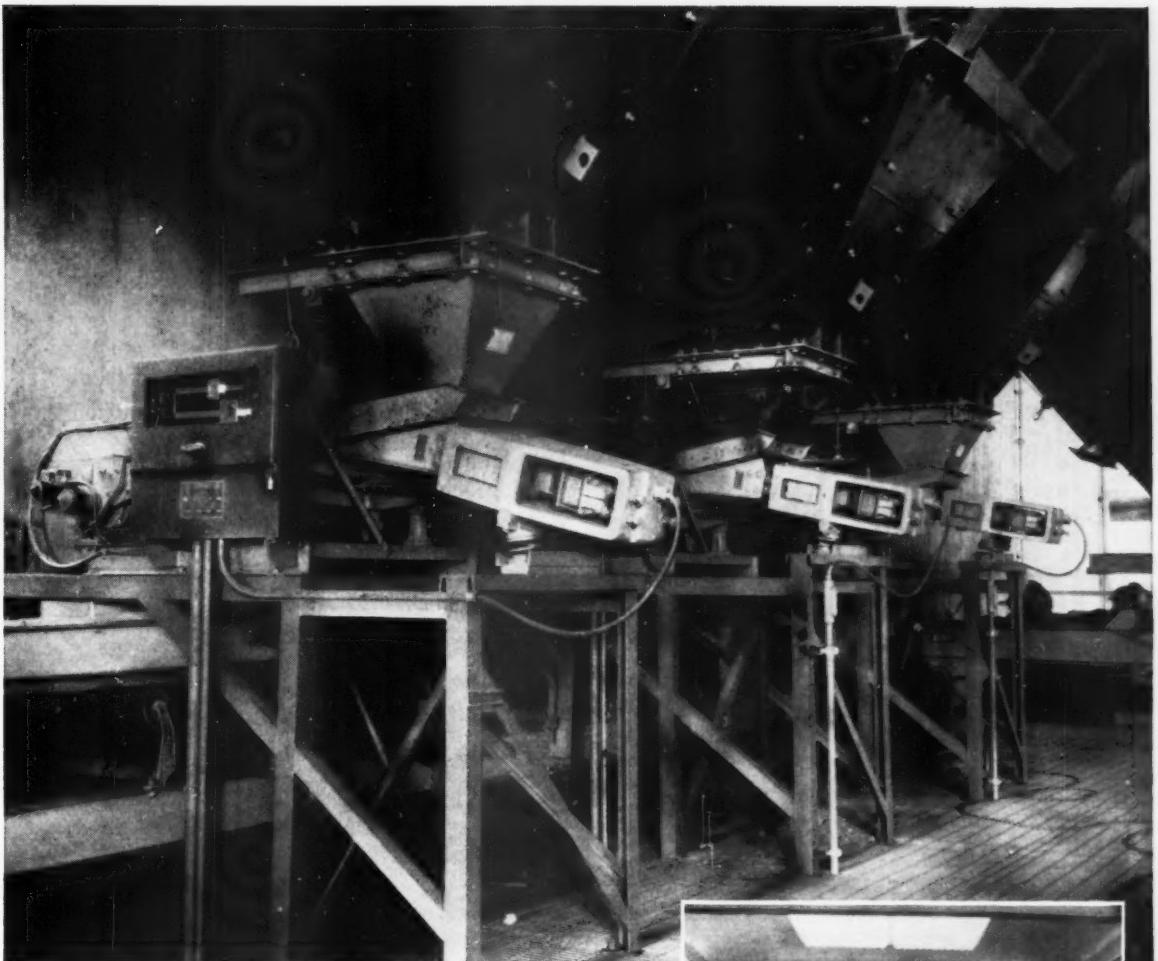
Currently, Ackerman is one of a board of consulting engineers working on the \$1-billion Feather River project to supply more water for the City of Los Angeles. He explained that Los Angeles, under an agreement dating back more than 30 years, is receiving a limited amount of water from the Colorado River. The supply is adequate at present, but by 1970 the city will need new sources. The consulting engineers are studying the most economical method of getting water to the city from Northern California. This would be largely a conservation of waters now flowing into San Francisco Bay.

Where does Ackerman think the greatest future lies for the consulting engineer? "Right here in the United States. There isn't enough good engineering planning being done right here. Most of the big mistakes are made in the planning stage. We should concentrate on developing sound planning and lead by example. If our performance is good enough we will be invited by responsible people of other countries to help them. And if we serve them with the kind of dedication to their interests that was demonstrated by Billings, we will be helping to build not only structures but also men—and the right kind of future for them."

In addition to his engineering, teaching, and counseling activities, Ackerman also has found time for professional organizations. He has devoted the majority of his activity to the ASCE, serving on committees and as president of the Brazil section of the Society.

He is also a member of the American Institute of Consulting Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Society for Engineering Education, and the National Society of Professional Engineers.

Ackerman is widely known as a professional engineer with a high regard for his profession. "I have always had reasons to be grateful for the early training I received. This is particularly helpful in examining the tremendous responsibilities and



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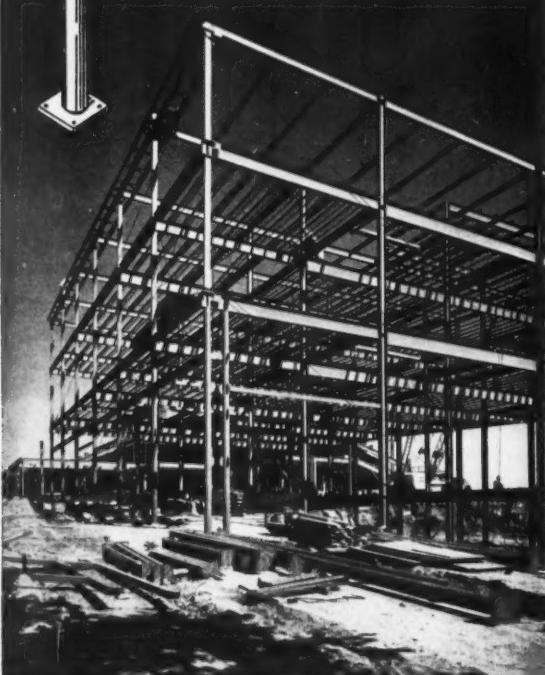
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ethical issues currently confronting our profession.

"By the circumstances of historical events and the rising influence of technology, many engineers today find themselves in positions of high responsibility. They often are called upon to make recommendations or decisions of far-reaching influence on future generations. By this means national policy can be formed for good or for evil. But how does the engineer recognize the hidden ingredients of potential harm to our economy?

No Time to Think

"One of the primary weaknesses in the engineering profession today is the lack of time to think about the broader issues of the national welfare. In the current technological revolution many engineers are too preoccupied with challenging technical problems, or they deliberately exclude the nontechnical factors from their concern. This has contributed to a general apathy with respect to the public welfare, and to a general reduction of self-discipline in professional matters.

"Here we are face to face with the great dilemma confronting the professional engineer, and particularly the independent consulting engineer. Never before in engineering history has there been a greater challenge to the exercise of our broad professional disciplines.

"We learn early in our college work that engineering is the art of applying the materials and forces of nature for the general benefit of mankind. This sounds very simple until we start to ask ourselves how much we understand about the forces of nature and how well we exercise the requisite wisdom in applying them. In the last 20 years there has been more progress in science than in all previous history. How many of our engineering leaders of today have taken time out from their busy schedule to acquire an understanding of these new ideas and new scientific forces?

"We pride ourselves in dedicating our professional knowledge and skill to the advancement and betterment of human welfare. This implies an overriding respect for the public interest and the application of high ethical standards, as stated in our pledge: 'To place service before profit, the honor and standing of the profession before personal advantage, and the public welfare above all other considerations.'

"But where is the evidence of our professional leadership in applying our new levels of knowledge in the best public interest? This is an old question. In the report of our ASCE Task Committee on Professional Education we called attention to one of the sharpest challenges bequeathed the present generation of engineers by the late Dean Mortimer E. Cooley. He wrote, 'For too many



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years the engineer has been limited, or has limited himself, to the making of the physical environment out of which have sprung the thoughts and actions of others. The engineer has played a passive part. He has been content in his field of applied science; in fact he has gone to sleep on the job. He has been asleep nearly as long as Rip Van Winkle. As matters now stand, the engineer creates the problem of his accomplishments, yet leaves the solution to the economist, the politician, and the statesman, who understand none of the technical phases of the problem. The engineer must be educated to the needed changes in his training which will enable him to take over the responsibilities of leadership that, by virtue of this technical civilization, are so largely his!

"Dean Cooley wrote this 15 years ago, but it applies today more than ever.

Inspiration From the Past

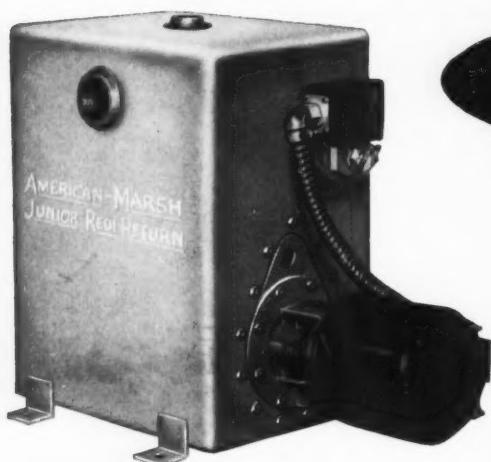
"A short 200 years ago the founders of our country opened new frontiers of land, opportunity, and freedom, and laid the cornerstone for developing this wonderful country of ours. They had no way of knowing the high levels of attainment which would be achieved, but, inspired by the compelling force of a religious faith, they gave us a Declaration of Independence and a Constitution which

have served continuously as our foundation plan.

"Today, in this age of technology, scientists and engineers are the founding fathers of new frontiers and of new opportunities. Some of their contributions and achievements touch the lives and well-being of every citizen for good or for evil. Can anything be more important to us than to be motivated in our hearts and consciences by the disciplines and religious faith of our country's early days?

"Many of our great engineers and scientists have been deeply religious. And why shouldn't this be? For as the engineer delves scientifically into the mysteries of nature, he discovers, step by step, the miraculous consistency of all natural law. These very laws are the foundations of a faith which the engineer applies in his professional work day after day — and quite subconsciously. Through that faith he exercises his great powers of creativity. If he stops to think about it, he will recognize that this "applied faith" is a powerful influence, and that it can be multiplied greatly if he applies it within the disciplines of a religious faith.

"In future years no greater tribute could be paid to the engineer of today than to have it said that, in opening up new frontiers in this age of technology, he has kept faith with the founders of our nation." ▲▲



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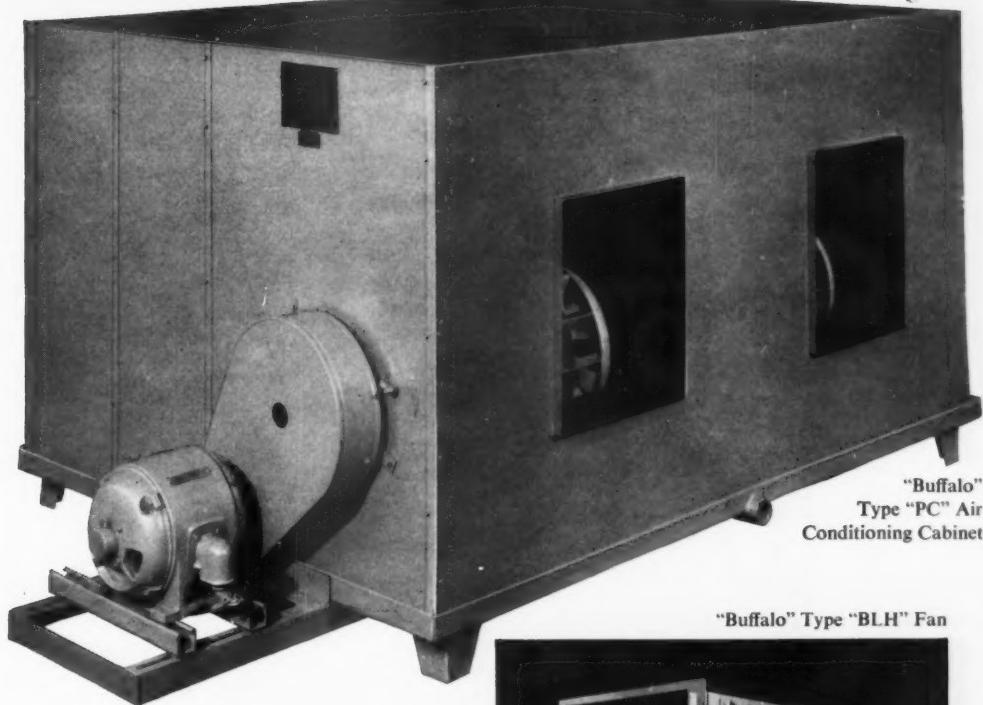
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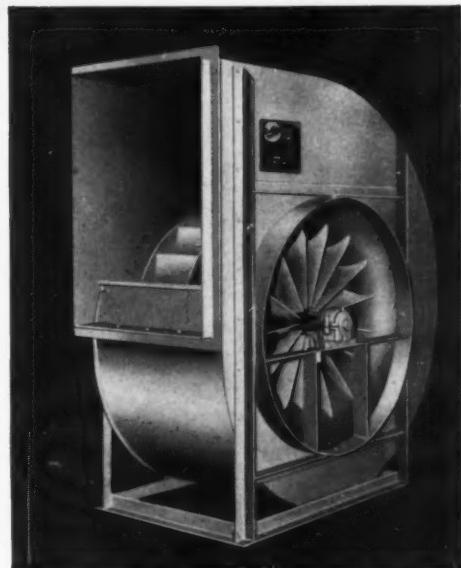
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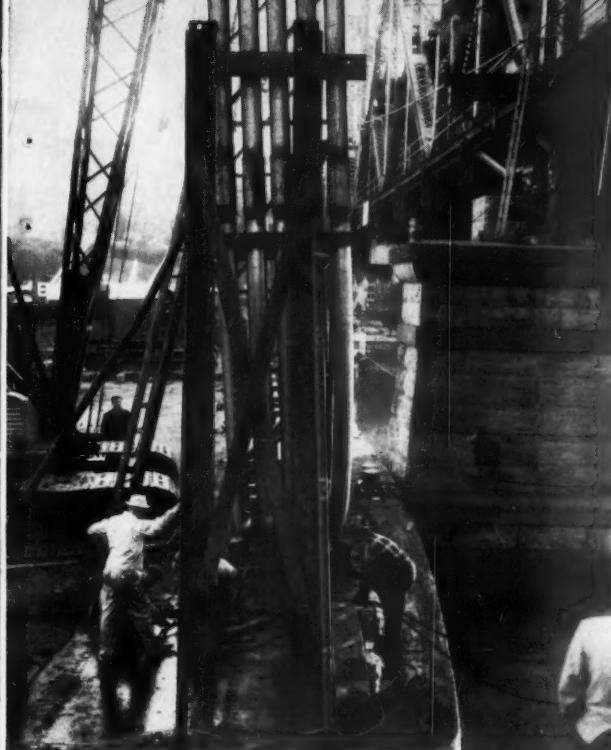
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Two ends of conduit were butted together inside the split sleeve coupling. Two clamps secured the longitudinal edges of couplings to conduit ends prior to tack welding. Then, clamps were removed and the welding job completed.

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Vinyl plastic panels are provided in deep or shallow style—plain or patterned—in a choice of attractive colors. Single or double panels can be obtained. Optional acoustic baffles, also with a choice of colors, provide effective sound control and add another design element for delineation and emphasis. Perimeter panels give interesting and attractive border treatment.

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SYLVA-CELL—This Sylvania modular system utilizes a 2' x 4' module and features a continuous pattern of cells. A choice of two attractive louvers is offered—polystyrene plastic or white painted aluminum, both with 45° x 45° shielding. Each ceiling offers excellent efficiency and shielding together with an even, widespread distribution of diffused illumination.

Sylva-Cell's simple, inverted-T grid work of extruded aluminum has extreme versatility for complete or partially-luminous ceilings. The louvered pattern can be used from wall to wall. Or, if desired, the interspersing of standard opaque ceiling materials makes a change in appearance, yet uses the same suspension system.

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smooth, uncluttered appearance.

These systems have been developed and perfected to give the designer almost unlimited freedom of expression. Color and patterns can now provide exciting vitality to routine ceiling areas.

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From the Editor's

Tranquil Tower

THE CASE AGAINST the Canons of Ethics builds up month after month. By now most engineers realize that the Canons are vague and open to all sorts of interpretation. Vague laws are not too dangerous when there is an established court system to interpret them, but the Canons are not interpreted by a single court. Many engineering societies (something over 80, if we recall correctly) have adopted the Canons, and it is reasonable to assume that each of them, if the necessity arose, would leave interpretation to its own ethics committee or board of review. Ideas as to what the Canons say and what they mean by what they say vary from one society to another and even from one state to another within a society. As a result, the Canons are nearly worthless as a code of ethics.

Just a few weeks ago, the Board of Ethical Review of the National Society of Professional Engineers took up Case Number 58-1 having to do with some government engineers who worked on preliminary plans and a report in connection with a hydroelectric project for a foreign government. Pretty obviously, these men, having become familiar with the project while in civil service, felt that their special knowledge put them in a position where they would be worth a lot more money to the consultants who got the job than they would be worth to their government agency. They made a deal with the consultant who got the project and went into it as a joint venture corporation.

The question before the Board of Ethical Review was simply, "Is that ethical?"

The seven members of the Board split, with four of them feeling that the action was unethical. Activities of this type "tend to bring dishonor to the Profession of Engineering." Two members did not vote, and one dissented with the opinion "that the men in question have not violated the Canons or Rules as they currently exist."

It is clear that both the majority and the dissenting opinions are right. The action of the government employees obviously was unethical, just as the majority stated, but it is also clear, as pointed out by the dissenter, that the Canons have nothing at all to say about it.

Once again, the Canons are at fault.

One trouble with the Canons is their tendency to become haloed by time. There is no excuse for this. The only code of laws that has stood the test of time unchanged is the Ten Commandments, and there is no reason for us to believe that the Canons are derived from the same Authority.

The Canons deal largely in platitudes and trivia and touch on nothing of real value not already covered in the Code of Ethics of the American Society of Civil Engineers, which, though somewhat less cluttered than the Canons, is, itself, no masterpiece of ethical thought.

Again, we point out that a top level EJC-NSPE joint committee should be formed to study the whole problem of professional ethics, preparing in the process not only a new code but a guide to its interpretation based on cases that have been brought before the several boards of review over the years. Then, a Joint Board of Review should be formed to hold all hearings involving members of any of the societies in EJC and NSPE.

This court would decide only what was ethical and what unethical; who was innocent and who guilty. Sentence for the guilty would be by the society or societies to which the guilty engineers belonged.

Surely EJC and NSPE are not so small in spirit as to refuse to cooperate on so vital a matter. It is also to be hoped that neither of them are so big headed or pig headed as to think they can go it alone. If ever there was a need for unity, it is in relation to professional ethics.



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CONCRETE PERFORMANCE REPORT:

Pozzolith concrete employed in Tri-Dam Project to meet full range of engineering requirements for all types of concrete specified

The Tri-Dam Project in south-central California is one of the most interesting hydraulic programs undertaken in recent years. Each of the three structures represents a different basic type of dam being constructed in North America today.

Donnells Dam is a graceful concrete arch. Tulloch Dam is a concrete gravity structure and Beardsley Dam a rolled earth fill dam with a concrete spillway.

Though these three dams were designed to provide year-round irrigation for two agricultural districts, the

\$52,000,000 in bonds required to finance construction is secured solely by future revenues from the sale of the 48,000 kilowatts generated by the three powerhouses.

Over 500,000 cubic yards of concrete were used in the Tri-Dam Project for tunnels, powerhouses and the dams themselves. Pozzolith was employed in all concrete except for a small quantity placed during the first few months of construction.

Evaluation tests—Shortly after the project began, laboratory tests were made to determine the quality and

Subsequently, 21,700 cubic yards of concrete with Pozzolith were employed for the spillway, penstock and powerhouse with a net savings of \$0.171 per cubic yard or a significant \$3,710 on Beardsley. The Pozzolith mix had the same slump and water-cement ratio as the plain concrete but required a lower water and cement content to achieve the same strength.

The Donnells Project—The dam is a concrete arch rising 484 feet above its bedrock foundation. Crest length is 960 feet. The spillway structure adjoins the dam on the left abutment.

TRI-DAM



DONNELLS DAM rises 480 feet above foundation. This project included construction of a 7-mile long concrete-lined tunnel, penstock and powerhouse.

economy of concrete produced with Pozzolith using the cement and aggregate already in use on the project. These tests revealed that mixes made with Pozzolith Retarder would lower the rate of temperature rise in the mass concrete, reduce the total heat evolved and would provide other basic improvements in quality. Tests also showed that substantial savings would be realized in the cost of concrete.

Field trials with these mixes followed. Careful attention was paid to aggregate coating and workability of the fresh concrete and to strength development under job conditions. The excellent results achieved in the laboratory were repeated in the field, and it was decided to employ Pozzolith in all concrete at Tri-Dam.

The Beardsley Project—The dam is a rolled earth fill structure 1000 ft. long and 280 ft. high with a concrete spillway. Although the volume of concrete placed at Beardsley was small compared to the other two dams, it provided an opportunity to carefully study the economic advantages obtained with Pozzolith.

Concreting at Beardsley had been underway several months before the use of Pozzolith was adopted. During this period some 16,400 cubic yards of plain concrete were placed.

Approximately 230,000 cubic yards of concrete were used in Donnells Dam and related structures. With Pozzolith Retarder, 364 lbs. of Type II cement per cubic yard and 6% entrained air, test cylinders averaged 4,000 psi at 28 days.

To hold the temperature of mass concrete at approximately 45° F at the time of placement, the temperature of concrete materials was carefully controlled. During hot weather this was accomplished by circulating cold air through the aggregate bins and obtaining batch water from a cold mountain stream. When the ambient temperature dropped below 35° F, the mixing water was heated and steam was used to warm the sand. In this manner the desired 45° placing temperature was maintained within close limitations.

The Tulloch Project—Tulloch Dam is a concrete gravity structure, 1600 feet in length, having a maximum height of 200 feet.

Though control of heat evolution was desired even during cold weather, it was felt that slow strength gain at early ages might result from the use of a retarder at low temperatures. Laboratory and field tests quickly indicated, however, that with Pozzolith Retarder, retardation occurred only during the first few hours after placement.



TULLOCH DAM stretches nearly 1/3 of a mile across the Stanislaus River. Here POZZOLITH Retarder proved particularly beneficial in mass concrete during summer months when the temperature soared up to 110°F.

TRI-DAM FACILITY is jointly owned and operated by the Oakdale and the South San Joaquin Irrigation Districts, California. Design Engineers: George T. Goodall Co. & International Engineering Co., Inc. • Project Engineers: Tudor-Goodenough Engineers • Contractors: Donnells Dam and Beardsley Dam—Tri-Dam Contractors (a joint venture by Morrison-Knudsen Co., Peter Kiewit Son's Co., Macco Corp., and Stoltz, Inc.); Tulloch Dam—The Arundel Corp. and L. E. Dixon Co.

requirements were met with substantial savings in cost of concrete—in fact, cost records show a total savings of \$172,500 on the entire project.

Throughout the project, Master Builders field men assisted in solving on-the-job problems . . . adding their experience and product know-how to the technical talents and experience of Tri-Dam Project engineers, contractors and concrete suppliers. Result: uniform, better quality concrete at lowest cost in place.

To better meet concreting requirements on your current and future projects—call in the local Master Builders field man. At no cost, he'll demonstrate—with your materials—that POZZOLITH will produce improved concrete . . . superior in performance, in quality and in economy.

PROJECT

and one-day strengths equaled those obtained with a non-retarded mix at the same temperature.

Most of the 240,000 cubic yards of concrete employed at Tulloch was batched out of a job-site plant. Savings resulting from the use of POZZOLITH approximated \$100,000 for an even greater per cubic yard figure than was realized on Beardsley.

Extreme temperature variations—variety of mixes—Concrete work at Tri-Dam extended through all seasons with temperatures ranging from 110° F during the summer to below freezing at night in winter months. A large

variety of concrete mixes, mixing methods and placing procedures were employed. Maximum aggregate sizes of these mixes ranged from 3/4 inch up to 6 inches and design strengths ranged from 2,000 to 3,000 psi at 28 days.

POZZOLITH and Master Builders field service—Employed in all but a small part of the 500,000 cubic yards of concrete in the Tri-Dam Project, POZZOLITH effectively aided the placing operation in all situations encountered. With POZZOLITH Retarder, heat generated in mass concrete was reduced and carefully controlled. Strength



BEARDSLEY DAM—an earth fill dam with concrete spillway. Work here demonstrated the lower cost in place of POZZOLITH concrete.

*The Master Builders Company, Cleveland 3, Ohio • Division of American-Marietta Company
The Master Builders Company, Ltd., Toronto 15, Ontario • International Department,
New York 17, N.Y. • Branch Offices in all principal cities.*

MASTER BUILDERS[®] POZZOLITH*

*Pozzolith is a registered trademark of The Master Builders Co. for its concrete admixture to reduce water and control entrainment of air and rate of hardening.

About the earthly side of the Corporal missile. The Army's Corporal missile is a surface-to-surface mobile artillery weapon. It's operational and it's in production. Tremendous quantities of materials fabricated into numerous pieces of ground support equipment operated by Army personnel are required to launch the Corporal with split-second timing and accuracy. And virtually all of the steel material required can be purchased from one source—United States Steel. Whether we're talking about carbon steel, high-strength low-alloy steel, alloy steel or Stainless Steel, steel fence, electrical cable,



How thin and light can you make the shipping container for a rocket, and still have a strong, impact-resistant shell? The transportation industry specialists in strong, lightweight construction have overcome this same problem with the help of United States Steel.



This Corporal transporter is made of steel. Why? Because this has to be a rugged piece of equipment to withstand the abuse of moving the missile over all types of rough terrain.

cement or wire rope, United States Steel maintains the technical services to provide the proper assistance to cope with any problem on these materials for ground support.

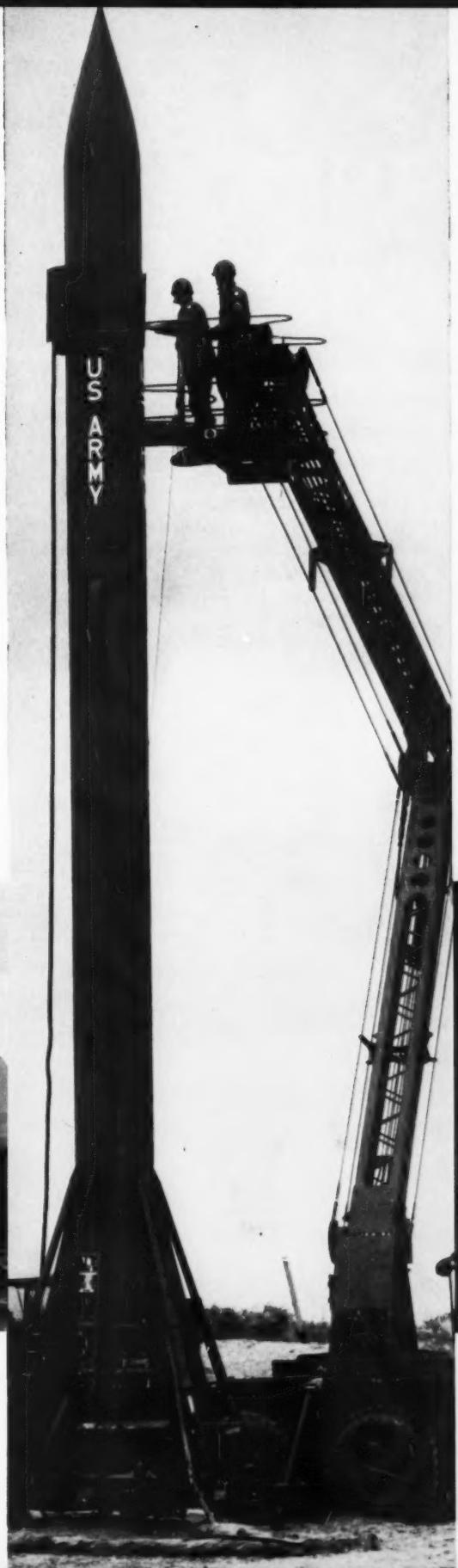
When a ground support program is ready for the drawing board, consult

United States Steel

USS is a registered trademark



Technicians are carried to the "brain" of the Corporal missile on a "cherry-picker." Its boom is similar to that of an industrial crane. United States Steel representatives are constantly working with the manufacturers of cranes and power shovels to develop more efficient strength-weight ratios and better rigging.





Combination Cycles For Steam Plants

(page 86)

Two Italian consulting engineers, Oreste Jelo, of Marelli Aerotecnica; and Piero Palatresi, of Techint, have combined their talents and their information to tell the readers of CONSULTING ENGINEER about the design methods used in air conditioning European skyscrapers. Following their discussion of air conditioning design in general, they take the Torre Velasca, a new office-apartment building in Milan, and use it as an example of good design. While they concentrate on mechanical aspects of the building, they also include a number of interesting comments on the structural characteristics of this "upside down" building. It is interesting to note that this mushroom facade resulted from a loophole in the Milan building codes rather than from architectural inspiration.

FIDIC Highlights and the Grand Tour

(page 96)

This year our trip to Europe was of a different type — no group of American consulting engineers visiting their colleagues abroad, just the editor and Hugh Duffill, consulting engineer of Boston. Duffill purchased an Aston-Martin automobile in England, so the tour was made largely by road. This provided an opportunity to study European highway design first hand and it let us visit some consulting engineers in the smaller European cities. The trip was climaxed by a visit to The Hague and attendance at the Annual General Assembly meeting of the International Federation of Consulting Engineers (FIDIC). Here engineers from Western Europe, Canada, South Africa, and the United States gathered to discuss mutual problems of private practice and make plans for FIDIC activities in the year ahead. For an informal description of the tour and the highlights of the FIDIC meeting, see "Europe—1959—Engines, Engineers, and Enterprise."

Carr Forrest and his partner James Cotton, of Dallas, decided that they wanted no part of a new building in the suburbs. They wanted to stay in downtown Dallas. They contracted for rental of a whole floor of a new Dallas office building and installed their executive offices and drafting areas. Then, they decided to do things up right and hire an expert to do the decorating. The results can be seen in "Forrest and Cotton Decorate a Downtown Engineering Office."

Higher Voltages Coming?

(page 116)

If in this country we go to higher voltages for commercial and office buildings and even for residential service, what higher voltages should we use? In industry, the trend has been toward 265/460 volts for three phase industrial voltage, but there has been much talk of 240/416 volts for three phase service and 240/480 volt systems for residential service. A. S. Anderson, of Ebasco, much favors this 240/416 volt level for commercial buildings, apartment houses, and other establishments of this type requiring three phase service. He also feels that 240 volts is proper for residential consumers, and in his opinion it is no more dangerous, if properly installed and maintained, than our current 120 volt level. Mr. Anderson puts up a good argument. See "We Need a New Service Voltage."

The Readers' Guide

It is possible to combine gas turbines and steam turbines in two basic types of combination cycles for large steam plants. The supercharged cycle is theoretically an excellent one, but the leading boiler manufacturers are not quite ready yet with their designs. The simpler possibility, from a design point of view, is the exhaust heat recovery combination cycle in which the gas turbine exhaust gases containing considerable oxygen are used as combustion air for the boiler. This second type requires nothing particularly new in the way of power plant design, but it does offer some interesting improvements in heat rate figures. In the article "An Economic Investigation . . . The Gas Turbin-Steam Turbine Cycle," I. Gabel, of Burns and Roe, Inc. gives a thorough comparison of this combination cycle and a conventional power plant cycle, for three different combinations of fuel.

Air Conditioning Europe's Skyscrapers

(page 92)

Professional Decor For Consultants

(page 113)

another G-E

PROJECT
'8000'
development

GENERAL ELECTRIC ANNOUNCES . . .

New Custom '8000'* Motors

PROJECT '8000' . . . a major General Electric program of research, redesign, advanced manufacturing and improved customer service on A-c motors 150 to 6000-hp.

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CUSTOM DESIGNED . . . New General Electric Custom '8000' motors are built specifically to meet your requirements. Selecting from specially designed enclosures, advanced insulation systems, custom-designed end shield and bearing constructions, and more than 15 custom-designed accessories—plus a countless number of electrical designs—General Electric engineers will create a motor to meet exacting needs, provide initial and continuing economy, and give long, reliable service. Turn page for features of new Custom '8000' motors.



NEW CUSTOM '8000' MOTORS GIVE TOP PERFORMANCE WITH LESS MAINTENANCE . . . HERE'S WHY

GENERAL  ELECTRIC

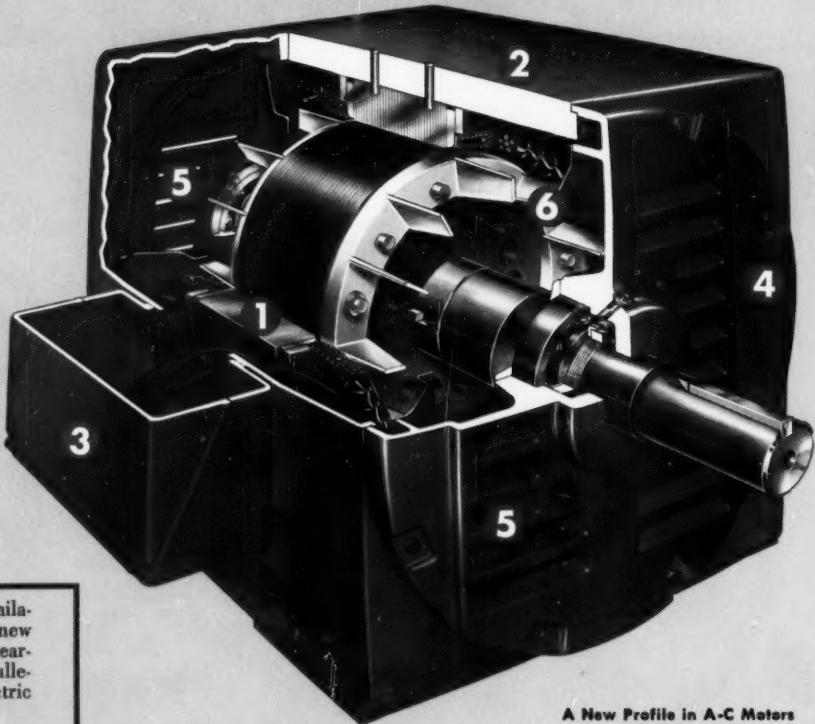
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another G-E
POWER
8000
development

NEW Custom '8000'* Motors Give Greater Reliability Require Less Maintenance

- 1 LONGER INSULATION LIFE—Pre-wound core allows closer quality control and gives longer insulation life through improved varnish impregnation or silicone rubber encapsulation.
- 2 BETTER CONSTRUCTION—Cast iron frame withstands 20G simulated transportation shock tests; resists corrosion.
- 3 FASTER INSTALLATION—Conduit box has up to 3 times volume of ordinary boxes; lifting lugs, cast to frame, hold up to 12 times motor weight.
- 4 EASIER MAINTENANCE—Flat end shields are more adaptable to addition of accessories or modifications; are lighter—easily handled by one or two men.
- 5 BETTER COOLING—Double-end ventilation, new duct design and louvred air openings provide more efficient air distribution through motor, reduce hot spots.
- 6 LOWER NOISE LEVEL—Sound power has been cut up to 50% by redesigning frame sections, rotor fans, air deflectors and intakes.

FOR COMPLETE INFORMATION and availability dates about General Electric's new Custom '8000' motor line, contact your nearby Apparatus Sales Office, or write for bulletin GEA-6865, Section 884-2, General Electric Co., Schenectady, N. Y.



A New Profile in A-C Motors
150 to 6000-hp

NEW *Polyseal** SILICONE RUBBER INSULATION SYSTEM IS AVAILABLE ON CUSTOM '8000' MOTORS

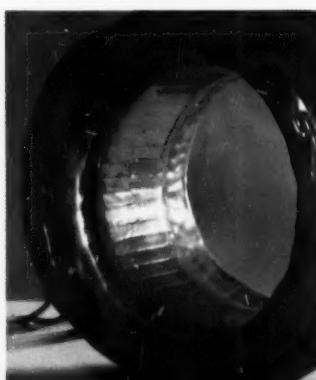
Silicone rubber used in Polyseal insulation systems is a product of General Electric's Silicone Products Dept., Waterford, N. Y. . . a leader in research, development, and manufacture of silicone materials. Supported silicone tape is a development of General Electric's Insulating Materials Dept., Schenectady, N. Y. Com-

bining silicone rubber with dacron-glass supporting materials is a major engineering advancement, giving this material both the mechanical and dielectric strength required for use as a motor insulation. Polyseal insulation systems are available *only* on General Electric motors. Medium AC Motor & Generator Dept.



FORM-WOUND MOTORS

Polyseal supported silicone rubber insulation system provides greater mechanical, thermal, voltage and environmental endurance than unsupported silicone rubber. Glass fabric materials are imbedded in each layer of silicone tape, which, after coil wrapping is vulcanized under heat and pressure to seal the system against moisture and contaminants. General Electric form-wound open motors with Polyseal insulation system can be used in some severe atmospheres formerly reserved for totally-enclosed motors.



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Polyseal silicone insulation system offers greater flexibility and better heat transfer than existing encapsulations . . . it operates effectively from -90C to 200C and will not crack under excess thermal cycling or severe moisture. After receiving G.E.'s standard random-wound insulation treatments, Polyseal insulation is applied to stator and end turns, completely sealing windings with a thin, waterproof, inert covering which protects against extreme moisture, most chemical fumes, dust and corrosion.

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Readers' Comment

Comments . . . from Norway

Sir:

As a member of the Executive Committee of FIDIC, I hope you can carry on with a world-wide coverage of events and of problems confronting consulting engineers.

E. N. Hylland
Consulting Engineer
Oslo, Norway

. . . South Africa

Sir:

I would like to advise you that whilst I find the whole of your well produced magazine interesting there are, naturally, certain features in it that my partners and I, as well as the senior members of our staff, find particularly so. Among these are such articles as those you have been running recently on purely professional matters, dealing with ethics, methods of operating a consulting practice, scales of fees, and so on. The relationship between engineer and architect, often a delicate one, was examined very objectively not so long ago. The sidelights that you give on the status of the profession in America is interesting, too.

Articles on new techniques always have an appeal and you might, perhaps, consider one day dealing with modern paint technology (a most important subject) which the engineer does not always take into sufficient account.

The copious advertisements included in each issue keep us up to date on what is offering in America, also the notes on new books. The local reports are, of course, a little difficult for us to follow, as would be expected in the case of anyone living outside the States.

Alfred Crawford
Crawford, Lowe & Partners
Pretoria, South Africa

. . . France

Sir:

I can assure you that I always read with the keenest interest the CONSULTING ENGINEER magazine.

In fact, all the articles contained in this magazine are indispensable for me and render me a great service in connection with our magazine, *l'Ingenieur-Conseil de France*, of which I am managing director.

I am free to admit that I am astonished at the quantity of advertising matter contained in your magazine, and I must say that the French manufacturers are much less apt in their presentations.

J. Lannes
Chambre des Ingénieurs-
Conseils de France
Paris, France

. . . Switzerland

Sir:

We would like to let you know that we enjoy very much reading your magazine. It tells us the newest advancement in U.S. engineering and gives us many good ideas for our planning. The well presented advertisements show us the offering of the American industries. As we



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Here is a complete, loaded, fully-instrumented, automatic ionXchange unit in a neat, compact, and ready-to-operate "package." It is equipped with our own Illco/Matic, all-plastic, air-actuated valves, which have been specially developed for ionXchange service. The Control Panel, also our own design and manufacture, provides all necessary quick-adjustment features, and requires only electrical hook-up to the terminal box on the frame. The only other connections required are to plant service.

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CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.**

are working at the moment on several projects for sludge digestment plants and do quite a bit of designing for water supply projects, articles on these subjects are of great interest to us.

W. Naegeli
Consulting Engineer
Winterthur, Switzerland

. . . Mostly Favorable

Sir:

We should like to congratulate you for the fine development your valuable journal has taken in the few years of its existence.

We in Switzerland, being a very sober and practical people, have a foremost interest in those papers which treat the daily questions of organization and management of consulting engineering offices, on which questions nearly every number contains a valuable contribution. Also the reports on the situation and opportunities of our profession in foreign countries should always be of interest. The biographies of famous colleagues are always worthwhile especially for younger members.

What instead we find futile are the announcements of projects reported; if all the consulting engineers would report, you could double the volume of your pages and nobody would take any interest in these columns.

Please accept a compliment for the pleasing front page, dedicated to meritorious members instead of to the best paying advertiser.

Dipl. Ing. A. Eigenmann
President, Swiss Society of
Consulting Engineers
Davos-Dorf, Switzerland

Slow Burn

Sir:

Apropos of your "Field Notes" in the May issue regarding "free engineering" and "agent engineering," I wish to add my bit to your background information. I have been simmering for some time about the "free engineering" business and something happened to

day that burned me up. I discovered that a heating contractor (unlicensed engineer) has been designing large heating systems for an architect.

It is a fact that fellow engineers, employed by manufacturers, do not hesitate to design and specify for architects and owners, thus depriving consulting engineers of their means of livelihood. This has occurred in the heating, air conditioning, electrical, lighting, structural steel, structural wood, conveying equipment, and power transmission fields in my experience. Architects are responsible for much of this bypassing of consulting engineers. I have been present and personally witnessed architects request manufacturers' representatives to furnish plans and specifications for various projects — in return for specifying their product. I must add that some few representatives have refused and suggested that a consulting engineer be engaged. However, the greater majority did the "free engineering."

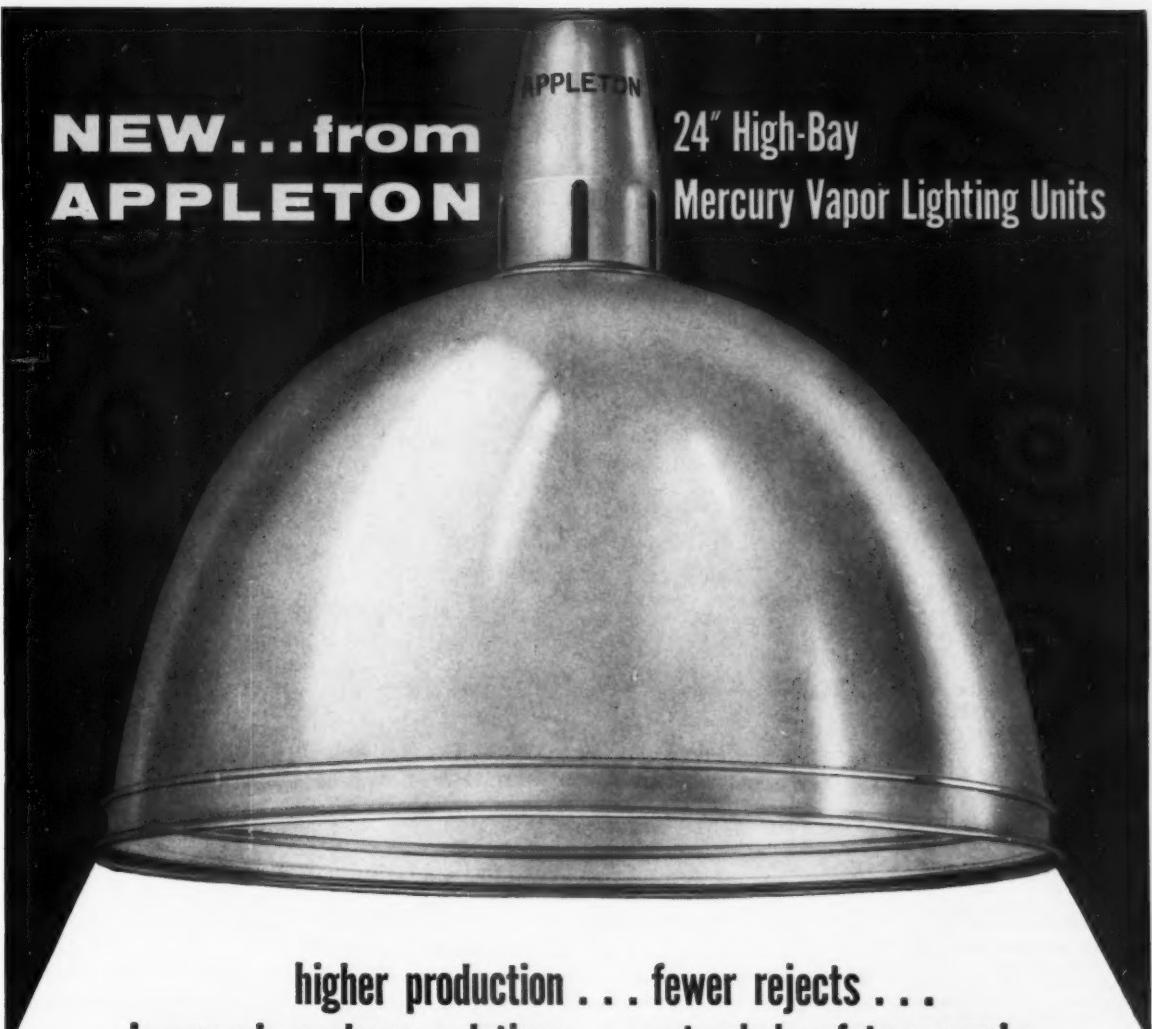
An interesting sidelight to the agent-engineer facts is the preponderance of sales engineers and representatives in the professional and technical engineering societies. Many consulting engineers of my acquaintance have resigned from these societies because, as they put it "they are full of salesmen."

I have remonstrated to representatives regarding free engineering but got nowhere. We certainly do not receive any sympathy from architects, since they think they benefit from free engineering. I was told by an architect that this is a "dog eat dog proposition, and ethics are something for the other fellow to live up to."

These days the value of engineering services on a building project often outweigh the architectural services. It is plain to see why they want to keep the engineers down, so the tail doesn't start wagging the dog. Talking and protesting will get us nowhere. We must start to apply pressure instead of

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SIMPLE—Easy to solve virtually any problem with aid of two or three Barco Joints.

The Barco HT (High Temperature) Flexible Ball Joint is a new development. It is the key to solving many PIPE EXPANSION PROBLEMS where high temperatures and pressures are encountered. The outer sealing gasket is a special, high temperature ring. The inner take up ring is self-adjusting to thermal expansion and maintains tight sealing action without building up high resistance (friction) to turning or angular flexing. HT joints can be supplied in sizes from 1" to 12", angle or straight, and can be fabricated from materials to withstand as much as 1000°F, 1200°F, or even 1400°F, under certain conditions.

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taking it. If some firms get hurt that is regrettable. Some of us were hurt—badly. As they say "dog eat dog."

It was bad enough trying to compete with agent-engineering, but when unlicensed contractor engineering also enters the picture, that is enough to make one mad; and I am mad.

Paul O. Emerick
Consulting Engineer
Kennett Square, Pa.

What's Wrong . . .

Sir:

The article "What's Wrong With Consulting Engineers?" in the June issue of CONSULTING ENGINEER is a wonderful presentation dealing with the malfunctioning of consulting engineers. I have observed cases or have heard reports bearing out practically every accusation made in this article.

Despite my general endorsement I note certain inconsistencies and generalities. The reader would assume that all consulting engineers work with or under architects, which is quite a false assumption.

The oft-repeated term "consulting engineer" under accusation should read "many consulting engineers," or some other limiting phrase. If provided the opportunity I could provide proof satisfactory to an impartial, expert, qualified investigator that at least one consulting engineer for a certainty—there are of course many others—who would score from 99 to 100 percent "not guilty" of the charges made in this article.

The evils perhaps are more extensive than I had realized, although I do know of many cases where the failure, ignorance, or fraudulent intent of a so-called engineer would actually warrant his permanent disbarment from practice, and possibly a jail sentence.

How do we go about separating the sheep from the goats? The engineer cannot criticize his competitors even though their vile practices and incompetence are



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NUGENT DUPLEX FILTER keeps all the lube oil clean for this Gas Turbine

The 7000 HP General Electric gas turbine shown above is destined for service in an East Texas chemical plant. A Nugent 1555BF-4L4 Duplex Filter is an integral part of the turbine system. Each filter comprising the duplex has a capacity of 150 GPM of 125 SSU viscosity lubricating oil. All the oil in circulation is filtered every cycle before going to the bearings. Foreign solids as small as 5 to 10 microns are removed; thus, harmful impurities cannot reach vital parts to accelerate wear.

Nugent Filters can lengthen the service life of your valuable equipment . . . reduce downtime . . . cut maintenance costs. Let us show you how. Write for information today.



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OIL FILTERS • STRAINERS • TELESCOPIC OILERS
OILING AND FILTERING SYSTEMS • OILING DEVICES
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known. The contractors pretty much know "who is who" in integrity, competence, and fair dealing, but they are very reluctant to tell what they know. Equipment and material suppliers are equally as tight-lipped. The architect, when allowed to select the engineer, too often does a bit of shopping for the lowest-fee engineer. The owner seldom makes any real study to determine the best qualified engineering firms, and when a political body makes the selection there is always the possibility that political considerations will outweigh professional integrity.

L. E. Wooten, P.E.
Consulting Engineer
Raleigh, North Carolina

Stick to Business

Sir:

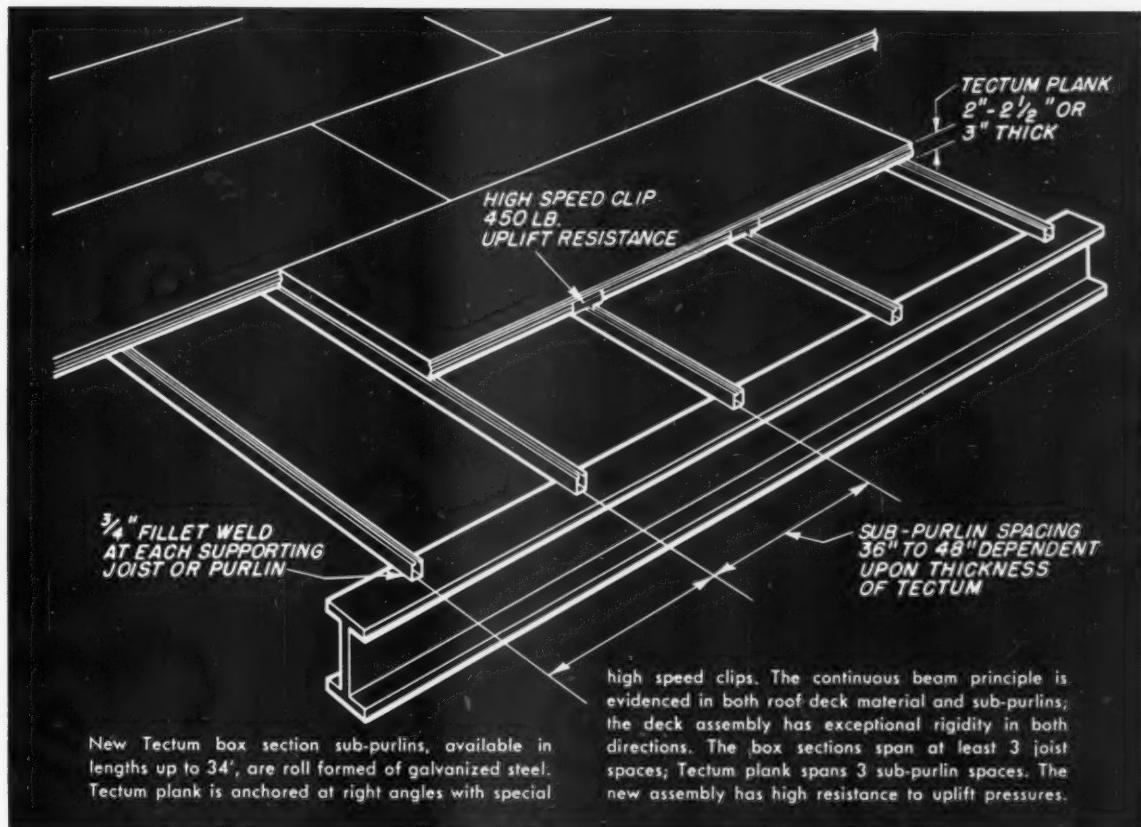
The subjects I appreciate most are those that might be termed of general interest to engineers in private practice. I refer to those articles on the business operations of offices, negotiation procedures, foreign country reports, and historical items of engineering interest.

Articles on technical subjects are usually of interest to only those engaged in the subject field. I find strictly technical articles of little interest if they are outside the field of our practice. However, there are those dealing with technical subjects but so written as to be of general interest, and these I usually read to acquire some knowledge of the subjects.

Along the lines of general interest articles on specific subjects, I would suggest coverage of the rapidly developing missile field and the active part played by the consulting engineers.

I enjoy your regular features such as the Legal Aspect, Word from Washington, Report from the West Coast, and your editorial comment. If any changes are contemplated, please retain these.

Austin B. Milhollin, P.E.
Barton, Stoddard & Milhollin
Boise, Idaho



NEW...TECTUM ROOF DECK ASSEMBLY a dynamic, new approach to roof deck design

*Tectum Box Section Sub-Purlin, Roof Deck Assembly
Applies 2-Way Continuous Beam Principle for Increased
Rigidity, Faster Erection, Excellent Appearance and
Lower Costs.*

The combination of Tectum plank and the new, light weight box section offers unusual design flexibility. Openings between roof deck and joist suggest a variety of methods for installing sprinkler systems, electrical conduit, air conditioning and heating elements. Box section sub-purlins are galvanized for long life and reduced maintenance. The clean lines of the silvery sub-purlin and the random swirl pattern of the exposed Tectum present a most pleasing appearance.

The new sub-purlins weigh about

half as much as conventional bulb-tees. The box section is priced considerably lower than comparable sub-purlin members and spacing between sub-purlins can be widened. Important savings are realized through lower sub-purlin costs, wider spacing, reduced weight and faster erection time.

For complete catalog information write Tectum Corporation, Newark, Ohio, or contact your Tectum Regional Office: Atlanta, Philadelphia, Columbus, Chicago, Dallas, Beverly Hills, Seattle and Toronto, Canada.



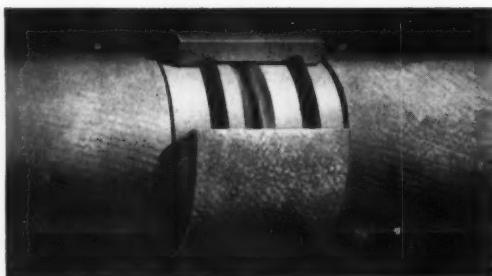
Standard high speed T-clips lock quickly into slotted box sections. Resistance to uplift pressures at the clip have been tested in excess of 450# at the clip, or 60 psf, meeting hurricane wind uplift ratings. Vertical load tests are certified by Pittsburgh Testing Laboratories and Ohio State University Engineering Experimental Station. Clips are completely enclosed at the plank joints — reducing thermal transfer through the roof deck.

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K&M ASBESTOS- CEMENT PRESSURE PIPE

its bore stays clean year after year



The finest coupling in the industry! Exclusive patented "K&M" FLUID-TITE Coupling connects in two easy steps. Seals tight and stays tight... no matter how high the pressure climbs. Sealing rings are self-energizing. No cumbersome coupling puller is required. And, a 5° deflection per coupling if you need it.

"K&M" Asbestos-Cement Pressure Pipe is as *modern* as the Jet Age in which we live. This tax-saver sends maintenance costs tumbling.

The bore remains smooth and clean... no clogging and no rusty discoloration of water... and pumping costs remain low. Being made of tough, high-tensile-strength asbestos fibers and portland cement, "K&M" Asbestos-Cement Pressure Pipe is practically indestructible. Won't corrode or tuberculate. And, it's completely immune to electrolysis. Joints are permanently, automatically root-tight and water-tight.



for uninterrupted, trouble-free service

"K&M" Asbestos-Cement Pressure Pipe is a thrifty pipe. Its low initial cost is often your last cost. Its lightweight reduces shipping and handling costs.

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RALPH S. TORGERSON

West Coast Editorial Representative

Report from the West Coast

WAGE AND SALARY PRACTICES of members of the Consulting Engineers Association of California are being studied in an effort to solve the problem of rising engineering labor costs within a framework of relatively rigid professional fees. Employee categories covered by the study range from beginning engineering draftsmen to top designers. Interest in the subject is indicated by the fact that out of 102 questionnaires sent to San Francisco Bay area members, 61 were returned with the requested information. A later mailing in Southern California is expected to bring equally good response.

Basically, the questionnaire seeks to analyze the cost of both salary and fringe benefits. Thus, considerable attention is devoted to hourly and monthly rates, frequency of payment, overtime practices, and hours worked, as well as bonuses, insurance programs, pensions, vacations, and sick leave.

While it was decided that no details of the study would be revealed at this time, there was evidence that fringe benefits were a big factor in rising engineering labor costs. For example, coffee breaks are now almost universal,

and most firms are offering medical and health insurance plans.

Discussions Enlightening

At the San Francisco meeting of CEAC on June 1, questionnaire results were analyzed on a confidential basis, and discussions were led by G. L. Gendler, of G. L. Gendler and Associates, and Robert M. Kennedy, of Kennedy Engineers.

Gendler discussed starting salaries in the consulting field in relation to electronic industries, aircraft companies, and other large firms. Since his firm specializes in mechanical engineering, his remarks were particularly pertinent. He cautioned that bonus plans must be studied carefully by consulting firms to be sure that they accomplish their objectives.

Kennedy also presented a thought-provoking talk. "Under present economic conditions of continuing inflation," he said, "we are concerned with the relative changes in engineering fees and engineering costs."

"We can see the changes in the cost of engineering materials and regular expenses such as rental, telephone, and travel. However, the cost of engineering labor has in-

SAFETY SWITCHES STAND UP UNDER 100,000 AMPERE SHORT CIRCUIT TEST!

INDEPENDENT TESTING LAB RELEASES FINDINGS AFTER GRUELLING "TORTURE RACK" TESTS

Unprecedented tests have been completed on 30 through 600 ampere rated Square D safety switches equipped with high capacity current limiting fuses. During these tests, switches were closed on a short circuit system delivering up to 100,000 amperes (symmetrical—R.M.S.). In addition, the fault was applied on the closed switches. All switches withstood the shocks without any sign of failure!

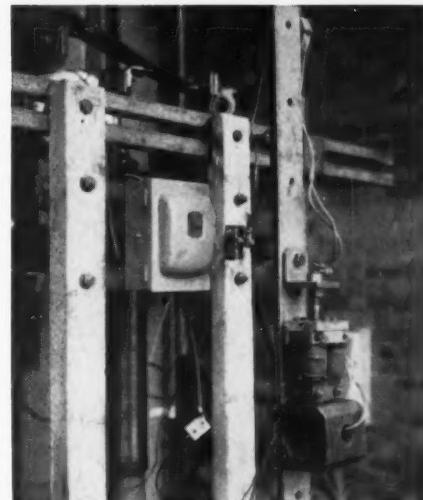
High Capacity Systems Demand Stamina

High capacity systems capable of delivering tremendous short circuits are becoming more and more prevalent with the growth of electrical loads. Network systems in metropolitan areas are a source of

such faults. Another, the heavy industrial areas, with a concentration of sub-stations and rotating machinery. Terrific stresses and heat generated by such faults are serious hazards to both personnel and equipment unless properly contained. That is why proven protection for switching service and feeder circuits is of major concern.

Square D Standard Switches Do The Job

These tests offer conclusive proof that standard Square D Type HD and Type ND switches, equipped with high capacity current limiting fuses, can be used on such systems without fear of failure. You pay no premium for the proven performance they offer. Why settle for less?



Square D switch on "torture rack" during test involving up to 100,000 ampere short circuit

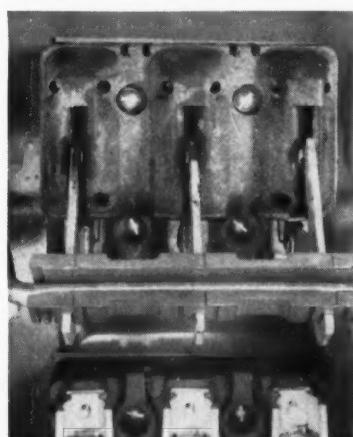
SUMMARY TABLE • Extract from Report No. 5/NA R64—Sheet No. 5

Ampere Rating	Voltage Rating	Catalog Number	Average Symmetrical Prospective Current R.M.S.	Recovery Voltage R.M.S.	Maximum Total Arcing Time	Fuse Type
30	250	A85351	96,600	252	.0009	A2Y-30A
30	250	A85351	96,400	253	.0010	FRN-30A
30	600	A85341	107,000	590	.0020	A6Y-30A
30	600	A85341	106,000	601	.0027	FRS-30A
60	250	A86352	96,400	248	.0010	A2Y-60A
60	250	A86352	95,200	252	.0019	FRN-60A
60	600	A86342	106,000	605	.0011	A6Y-60A
60	600	A86342	108,000	598	.0020	FRS-60A
60	600	A86342	107,000	601	.0013	NAS-60A
100	250	A86353	95,200	253	.0009	A2Y-100A
100	600	A86343	108,000	604	.0014	A6Y-100A
200	250	A86354	95,200	253	.0037	A2Y-200A
200	600	A86344	107,000	602	.0011	A6Y-200A
400	250	A86355	85,900	252	.0039	A2Y-400A
400	600	A86345	106,000	611	.0050	A6Y-400A
600	250	A86356	94,500	251	.0062	A2Y-600A
600	600	A86346	107,000	601	.0062	A6Y-600A

Above • Extract of Nelson High Power Laboratory Report C/NA-66

At left • No sign of failure in this switch interior after 100,000 ampere short circuit test

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SAFETY
SWITCHES
GIVE YOU
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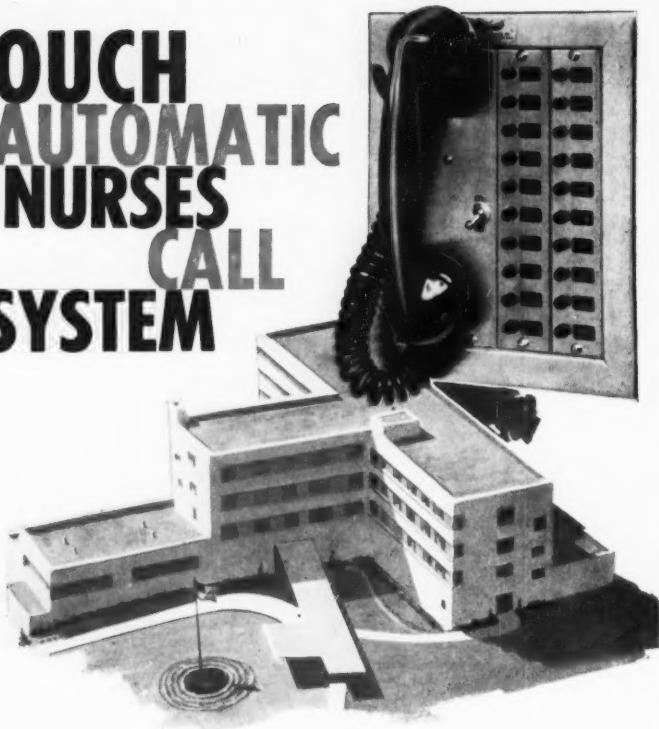


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Couch U/L approved Nurses Call Systems provide:

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Nylon pull cord stations provide these advantages:

- Automatic or manual reset
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Optional system features:

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creased in many ways, some of them so subtle that we may be unaware of how we really are affected.

"Being aware of the 6 to 7 percent annual increase in the construction cost index, I had assumed that any fees based on percentage of construction cost would increase at a rate adequate to cover increases in engineering costs. A couple of things I read several months ago caused me to look into this in more detail.

"First was an article in a well drillers' journal advising well drillers of a lack of correlation between the ENR Construction Cost Index and well drilling costs, due to the higher proportion of labor in well drilling. Shortly thereafter there were reports that the committee preparing new ASCE percentage fee curves had come up with a lower fee rate on smaller jobs and no significant increases in the remaining percentage fees.

"At about this time we closed our books for the year's operations. A review of these figures gave food for more thought. I found that labor cost in engineering is about twice the percentage for the complex mechanical-electrical contracting field. This would make total job cost for engineers even more sensitive to labor cost changes than the construction cost index.

"The most obvious factor in labor cost is rate of pay. In my review I considered monthly rather than hourly rates since all of our engineers are on salary. Since my personal acquaintance with engineering salaries is pretty much limited to the period since 1930, I assumed them to be at an ENR index of 200 as of that time, the same as for common labor. This checked roughly at an index of 100 for rates paid engineers by railroads in 1910-13, the base period for the ENR index. On this basis, the ENR index of engineers' salaries has risen to over 1000 while the construction index has risen to 800.

"Another change that affects the cost of engineering labor is the

LIFETIME SERVICE BACKS UP OCOTILLO'S NEW LJUNGSTROMS®



Extremely compact and highly efficient, these baskets of heat transfer surfaces are the heart of the Ljungstrom. (The photo below shows one being lifted into position.) Every inch of these baskets is the approximate equivalent of one foot of a standard tubular heat exchanger. The combined surface of the Ocotillo Air Preheaters provides 263,600 sq ft of heating surface.

The new Ocotillo Power Plant, near Tempe, Ariz., employs four Ljungstrom Air Preheaters for its two 835,000 lbs/hr boilers. Dependability is built into these Ljungstroms, from their corrosion-resistance to their double-life reversible elements (shown in the photo above).

But one of the most important reasons why Ocotillo chose Ljungstrom is Lifetime Air Preheater Service. Throughout the life of each unit (units dating from 1923 are still in operation), Air Preheater engineers make regular calls to inspect the units and keep them in top operating condition.

What's more, Air Preheater provides rapid factory service, too. Here's an example: a customer called on a Friday morning requesting immediate shipment of cold-end seals for an Air Preheater. But regular fabrication time would take until the weekend, when no ordinary transportation would be available.

So Air Preheater went to work. Spe-

cial trucking was arranged. And by a tremendous effort, fabrication was completed *on the same day the order was received . . .* and the customer received the necessary parts *only ten hours after his initial request.*

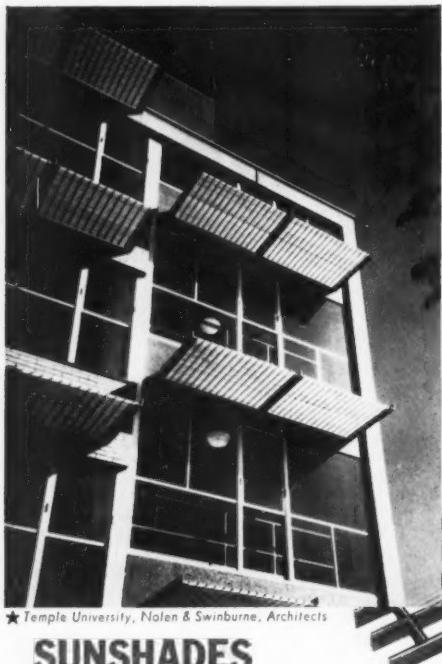
Fast response to emergencies and regular inspection throughout the life of each Ljungstrom installation are two of the many advantages Air Preheater provides its customers. Another is expert knowledge of boiler and preheater problems—and how to lick them—gained from over 35 years' experience. Perhaps these reasons explain why nine out of ten preheaters sold today are Ljungstroms.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N.Y.



MODERN SUN CONTROL



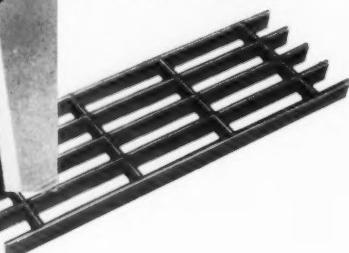
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beauty and economy

Clean, simple, care-free
Irviso grating affords
functional, practical
advantages — blends
gracefully with
modern building design



IRVICO GRATING
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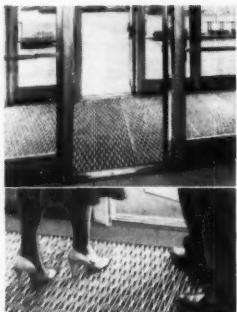


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of standard panels of Irviso aluminum grating
reduce cooling costs and add handsome "transparent" appearance
to this four-story classroom building.

The open mesh won't trap hot air next to glass.

Grating panels are strong enough
to be used as window cleaning walkways.
They provide a permanent, practical solution
to the problem of sun control.



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Dirt and slush
drop through open-mesh grating
into receptacles below
then are flushed into sewers,
preserving interior cleanliness.

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length of work week. The 48-hour wartime and prewar work week has been cut back to 40 hours. This makes the effective salary cost index rise to 1200 in 1959. On this basis, engineering costs are rising at nearly twice the rate of engineering fees that are based on the construction cost.

Other Factors

"Other factors that also influence the total cost of engineering labor have either just appeared in the last few years or have risen significantly. These sometimes are lumped into overhead, where their effect on labor cost often is overlooked. They include:

- ¶ Increase in paid vacations and time off from work
- ¶ Employer paid insurance
- ¶ Payroll taxes
- ¶ Cost of administration of withholding taxes and other necessary payroll reports
- ¶ Time taken for professional association activities
- ¶ Time and one-half rate of compensation for overtime.

"It is obvious that, in the long run, only an engineer who has professional status can turn out work of true professional caliber. His working conditions must reflect this professional status. His salary must justify the expensive academic training required, and it must not drop behind in the inflation spiral. The rewards of an engineering job well done cannot replace the impact of pay check dollars.

"While we can make our engineers more effective by use of work aids, machines, and new techniques, we should be aware of the continuing squeeze between the rising engineering costs and the real money value decline of consulting engineering fees."

CEAC Mourns Loss of Calahan

Pecos Calahan, a friend to the young professional engineer and a confidant of the leaders in the profession, died suddenly on June 9, at the age of 73. He had been ex-



YARDSTICKS FOR GASKET PERFORMANCE

The No. 1 reason for specifying Flexitallic Spiral-Wound Gaskets is predictable performance. The compression characteristics of each Flexitallic Gasket are always related to the pressure/temperature ratings of the flange. They are made for each other.

But, beyond this, engineers know that Flexitallic Spiral-Wound Gaskets give important advantages such as:

- Wet or dry, there is no change in the compression characteristics of a Flexitallic Spiral-Wound Gasket.
- In Style CG Flexitallic Gaskets, the standard ring completely seals the flange with steel, and

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

gives positive indication of effective bolt load.

- The Flexitallic Spiral-Wound construction gives the safest possible seal for flammable or toxic fluids.

Flexitallic Blue, the blue-dyed Canadian asbestos filler, identifies the original Spiral-Wound Gasket construction.

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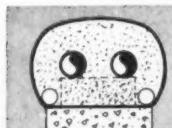
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SPIRAL-WOUND GASKETS

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**Three improved
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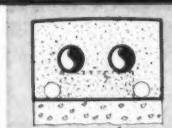
**matched to the construction specifications of
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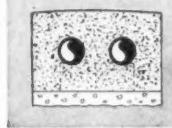
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is expected to be over the
conduit.

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For your jobs in which water
may be over the conduit
periodically.



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WATER RESISTANT
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For your jobs in which rain or
irrigation water may stand over
conduit occasionally.

ONE of these three widely successful conduit systems is the right choice for particular sub-surface conditions and job engineering considerations.

Contact the certified CTC Contractor near you for qualified information and estimates on the system best suited to your requirements.

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ecutive secretary of the Consulting Engineers Association of California from its inception in 1952, and secretary of the California Legislative Council of Professional Engineers. He was a past secretary of the California Council of Civil Engineers and Land Surveyors, and had been a member for many years in the American Association of Engineers, the American Society of Civil Engineers, the Structural Engineers Association of Northern California, and the Engineers Club of San Francisco.

Calahan started his engineering career as a draftsman for the Santa Fe railroad and later worked for the Rock Island railroad. He became one of California's first licensed engineers, and was very active in maintaining the high standards of the engineering profession. From the 1930's until 1952, he served as secretary of the California Board of Registration for Civil and Professional Engineers. In 1928 and 1929, he was secretary-treasurer of the Southern California Chapter of the Associated General Contractors, at its office in Los Angeles.

John Blume, president of CEAC, has announced the temporary appointment of Mel Doernhoefer of Los Angeles, who will assume the duties of acting secretary-manager, maintaining the Association offices in the San Francisco area.

Engineer Sponsored Bills Fail

James E. Hastain, president of the Arizona Consulting Engineers Association, reported that the recent Arizona legislative session failed to pass the three bills sponsored by the Association. One of the acts that did not get out of committee would have increased the state engineer's salary. As all salaries of engineers employed by the Arizona State Highway Department are dependent upon the salary of the state engineer, all engineers in the state supported this bill.

The Association also sought passage of an enabling act for a build-



Climate by Chrysler

**500 tons of cooling power
from a 400-hp motor
brings double savings to
new Greenville Auditorium**

A 500-ton Chrysler Centrifugal Liquid Chiller is the heart of the air conditioning system in the new Memorial Auditorium in Greenville, S. C. It cost less to install . . . and every second it operates, it's saving more money. Here's why:

Chrysler's exclusive true volute compressor casing design reduces horsepower requirements per ton of air conditioning. So Greenville saved money on initial costs by using a 400-hp motor . . . instead of the 450- to 500-hp motor needed by similar units. Operating costs are lower, too . . . because the smaller motor takes less power.

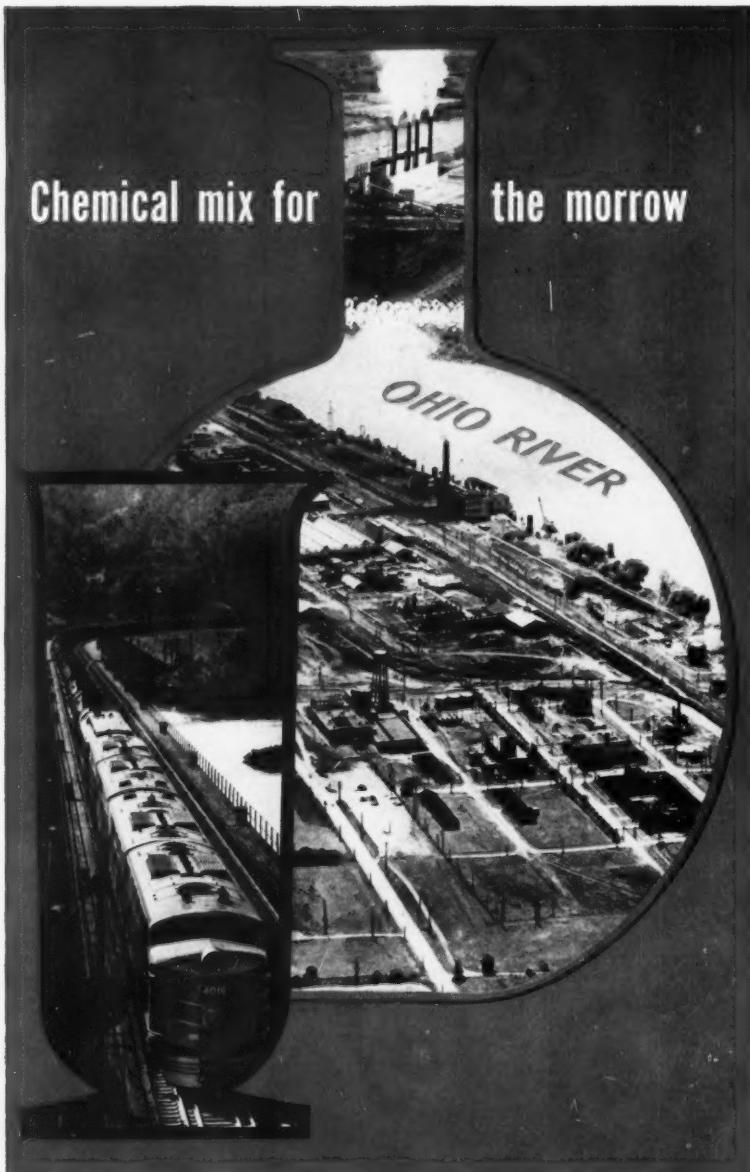
Whether there are 7,000 people—or 700—inside the auditorium, this versatile system handles the load perfectly. With Chrysler's exclusive adjustable guide vanes, output of the system can be reduced to 10% of maximum capacity, providing the most economical operating conditions for any size audience.

No matter how large the air conditioning job, Chrysler Liquid Chiller equipment can be custom-engineered to your needs. For complete information, contact your local Chrysler Applied Machinery and Systems sales office. Or write: Airtemp Division, Chrysler Corporation, Dept. X-89, Dayton 1, Ohio. In Canada: Therm-O-Rite Products, Ltd., Toronto, Ontario.



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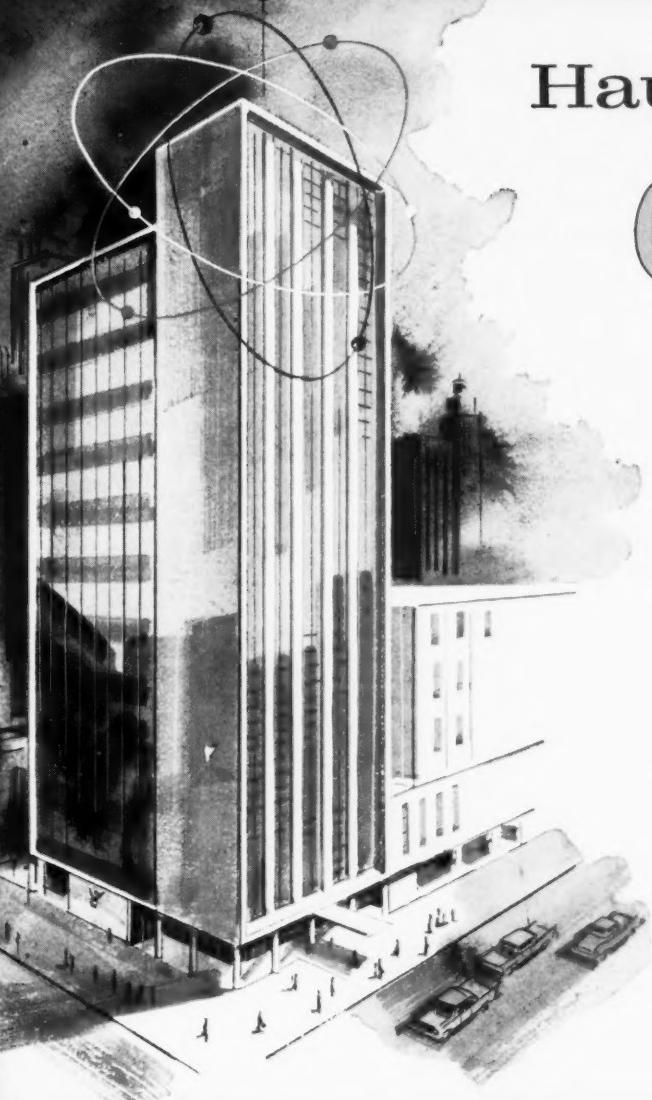
ing code. This bill would have permitted individual counties to operate under a building code, which would help the counties establish higher standards of construction.

The third bill would have provided better irrigation and flood control. The proposed studies and corrections in the present system would have resulted in some very desirable improvements.

Computers to Replace Engineers?

"Machines will do 80 percent of the work now done by structural engineers," was the startling statement made by Dr. Morley English, professor of engineering at UCLA, at the June meeting of the Structural Engineers Association of Southern California. Engineers, he said, will be increasingly relieved of the drudgery of lengthy and tedious calculations, and even a large percentage of the drafting on working drawings. The machine can be set up to do 80 percent of the work involved on an engineering project. Prof. Morley pointed out that the remaining 20 percent will be made up of creative thinking, human relations, and the exercise of judgment in feeding problems into the machine and evaluating the results. The engineer of tomorrow will be five times as productive as he is today!

Alfred E. Waters, structural engineer for Quinton Engineers, Ltd., told about the use of a computer in actual structural design. He explained that the economic parameters governing the use of machines depend on the number of repetitions of a problem adaptable to machine calculation. For a "one shot" situation, the cost of programming and rental of a machine may offset the economic advantages. One of the major values is the speed with which a machine can determine the optimum design for a given project. The economies resulting from an early determination of the most economical system may offset the cost of renting or purchasing a computer. □



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Elevonics...the application of electronic devices for the betterment of elevator design and performance. It is in this special field of science that Haughton Engineers are opening new doors to progress in elevator technology. For example: Haughton Elevators that *think for themselves* are now operational in buildings coast-to-coast. They combine the economy and efficiency of true automated (operatorless) control with new swiftness, comfort and safety.

Motivated by an amazing electronic brain that anticipates elevator service needs at every moment in a busy building's life, these elevators are dispatched at proper time and in proper sequence to meet traffic needs exactly.

And, though complex is the job they do, Haughton operatorless elevators that *think for themselves* feature simplified design to assure complete reliability and substantial savings in operation.

If you want to upgrade elevator service and cut costs, call on us. A background rich in experience, and a future dedicated to the quest for new advancements in elevator technology, are your assurance we can best meet your elevator design, modernization or maintenance needs.

throughout America... Haughton Operatorless Elevators



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Michigan; Smith, Hinchman & Grylls,
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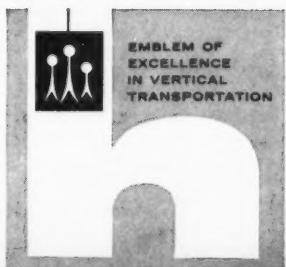
National Bank of Detroit, Detroit,
Michigan; Albert Kahn & Associates,
Architects



Libbey-Owens-Ford Building, Toledo,
Ohio; Skidmore, Owings and Merrill,
Architects



Universal Building, Washington, D. C.
LeRoy Werner, Architect

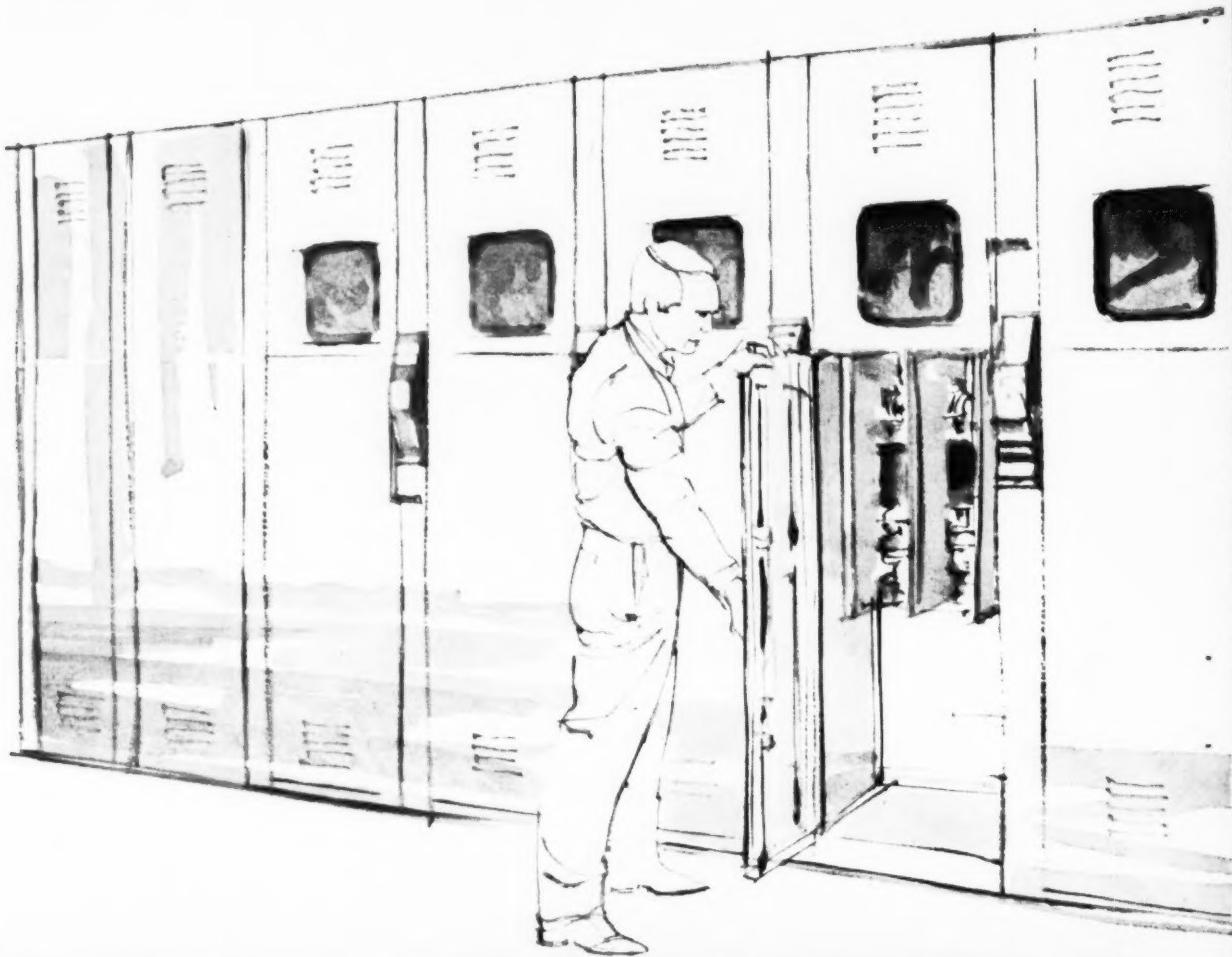


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Complete range of ratings—I-T-E CORDON® circuit breakers are available in ratings for a wide number of applications. Provide up to 100,000 amp interrupting capacity with molded case construction. Save 50% switchboard space. Cost approximately one-third less than alternative devices. Ideal for protection of circuits supplied by high-current-capacity sources. Can be supplied loose or individually enclosed.

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(4.16 and 13.8 kv)
- D-c circuit breakers

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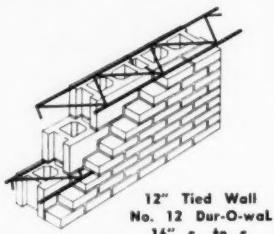
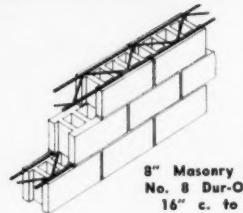
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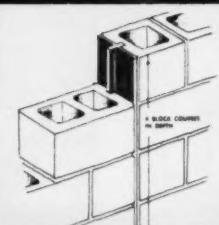
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Heard Around Headquarters

THE RAPIDLY EXPANDING New York State Association of Consulting Engineers, with 80 members, three member associations, and two good prospects for new member associations, believes in action when it comes to ethics. At its Second Annual Meeting, held recently in New York City, the Association announced it has filed three cases of ethics violations with the State Education Department. Another case also has been filed in cooperation with the New York State Society of Professional Engineers.

President James N. DeSerio explained that his group is taking no chances on "accidental loss" of the evidence. Photostats of all evidence submitted and signed receipts for the evidence are being kept on record by the Association. It is not unknown in the past for such evidence to be misplaced.

DeSerio explained that his group plans to get action against persons practicing engineering unlawfully. "We will not fail to file a complaint for fear of losing a case. If the law has loopholes, we want to know it. Then we can proceed to get the laws changed."

As one Board member put it, "we want to be sure that the cases we present are for prosecution, not for investigation." The Association gathers all evidence necessary, thus

greatly increasing the chances of something being done about the cases. "We know the problems. It will take some time to find the answers," DeSerio concluded.

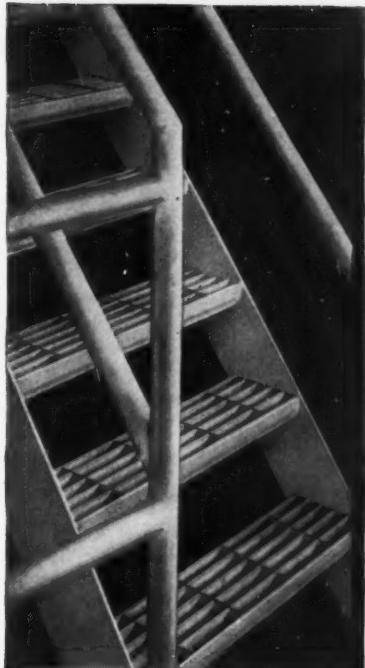
The Association also has adopted a Code of Practice, consisting of a dozen rules of conduct.

The problem of unqualified persons listing themselves as engineers in the yellow pages of telephone directories is being handled by local chapters with a minimum of fanfare and pretty good results. In Rochester, calls were made by Association members to each of those improperly listed in the telephone book. The calls were sufficient for "complete cooperation" in voluntary withdrawal of the unqualified.

At least one case of "free engineering" was handled the same way, with good results. The Association members merely talked with the equipment vendor involved, and the firm agreed to stop offering such services.

The ethical practices committee should be busy in the coming year. An investigation is to be made of political patronage. Discussions, in cooperation with the New York (City) Association of Consulting Engineers, with the Department of Public Works also are planned.

Final changes were scheduled for mid-July for a State Associa-



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tion fee schedule. Members were asked to send all suggestions for changes in the proposed schedule to the committee chairman, who was to call a special meeting to complete the schedule.

A Manual of Practice for Work with Architects also is being completed. A blank page is to be left for each chapter to insert fee schedules due to the wide variation found in various parts of the state.

Also at the Association meeting: *Annual Dues Increased* — from \$55 to \$60 per member.

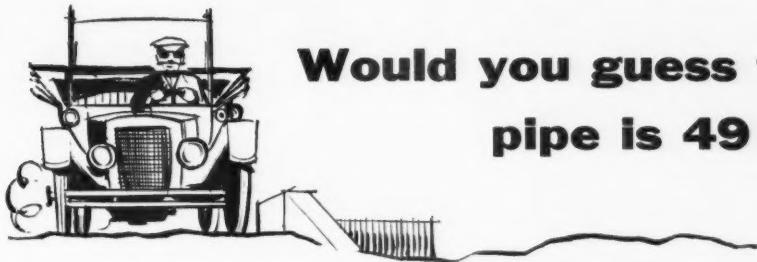
No Members-At-Large—the Association decided that the State need not accept members-at-large. From just about any portion of the State, an interested consulting engineer could join some chapter. If Albany and Binghamton chapters are formed this year, as expected, it will be even easier to find a nearby chapter to join.

Cooperation — John F. Hennessy Jr., president of the New York Association of Consulting Engineers, said that the New York City group will be happy to cooperate with the State Association on legislation and any other matters that might arise where the two groups should work together. Speaking at a luncheon meeting of the State group, Hennessy gave a summary of the history and current programs of his Association. Leigh St. John, president of the New York State Society of Professional Engineers, also assured the State Association of cooperation on the annual battle against corporate practice.

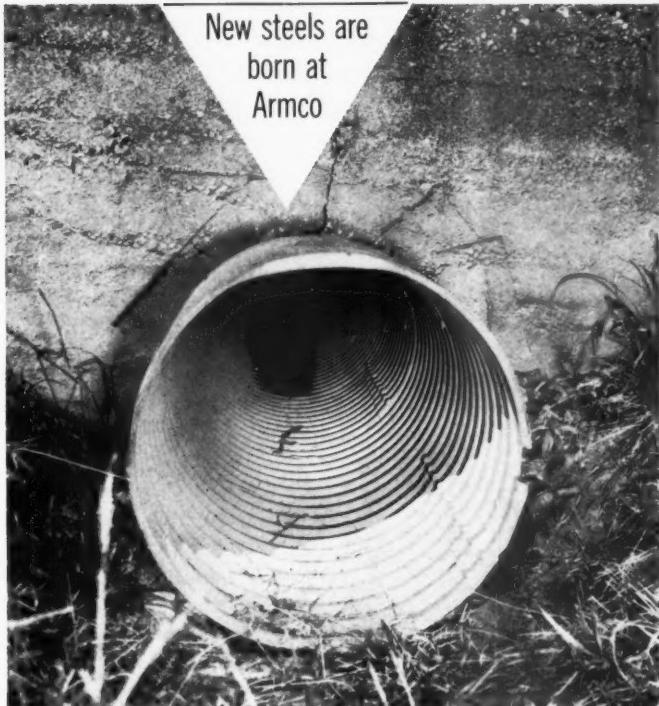
Roster Requested

On behalf of the New Jersey Association of Consulting Engineers, State Senator Robert Crane, of Elizabeth, N. J., has requested that the Examining Board compile a list of New Jersey engineers, indicating in the listing which ones of the engineers are in private practice.

The Jersey Association also decided, at its annual meeting, to admit associate members from Pennsylvania, Delaware, or other near-



Would you guess this Armco pipe is 49 years old?



New steels are
born at
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Recent photo of culvert site.

Probably not. But this Galvanized Armco Pipe, 24 inches in diameter and 36 feet long, has been serving as a culvert under a farm entrance road since 1910.

This culvert has been periodically inspected by engineers as a part of Armco's continuing research on the durability of highway conduits. And for the past 30 years the condition of the structure, in both material and structural durability, has been about the same. How much longer do you think it will last—25, 50, 100 years?

For more details on Armco Corrugated Metal Drainage Structures, write us. Armco Drainage & Metal Products, Inc., 7419 Curtis Street, Middletown, Ohio. In Canada: Guelph, Ontario.

This recent photo shows a close-up of a 49-year-old Armco Pipe, installed as a culvert in Darke County, Ohio.

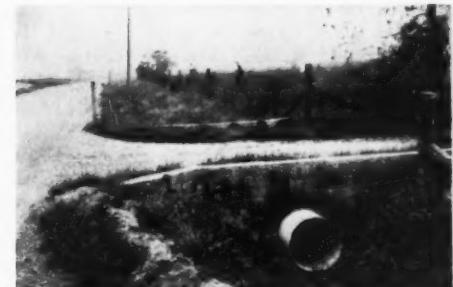


Photo of culvert in 1924.

LITERATURE FOR CONSULTING ENGINEERS: "Brief Data on Armco Corrugated Metal Drainage Structures;" "Sewer Manual;" "How to Install Corrugated Metal Drainage Structures;" and "Armco Products for Industry." In writing, mention literature desired.

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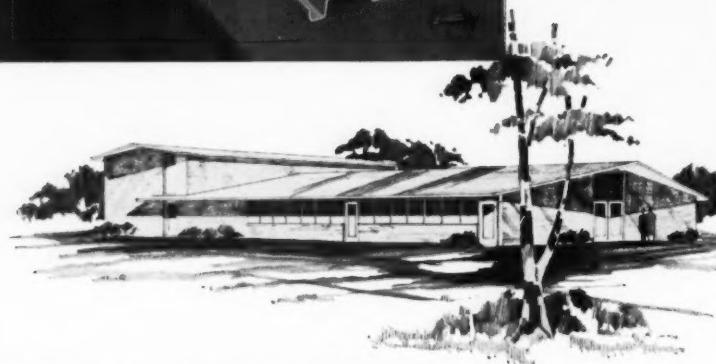
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by areas that currently do not have consulting engineer groups.

At the September meeting, the group again will discuss joining the Consulting Engineers Council. At the annual meeting, a majority of the members present were reported to have been in favor of joining. However, there was not a quorum, so no action could be taken. In the meantime, questionnaires have been circulated asking if the members would like the Association to join CEC as a group or if they prefer to join as members-at-large.

Officially Invited

Executive Committee of the Engineers Joint Council, at its mid-June meeting, officially approved the addition of a Consulting Engineers Council representative to sit with the engineers on the EJC-AIA joint committee. Prior to the invitation from EJC, CEC had been invited to attend the meetings with the architects.

No Help Needed

The International Cooperation Administration recently requested that the Engineers Joint Council review a questionnaire prepared by ICA for use in the employment of consulting engineers for service on foreign projects.

EJC dutifully reviewed the questionnaire and suggested:

¶ That the title of the form be changed to indicate that it is only for consultants, not contractors.

¶ Add specific authorization for the granting of projects to joint ventures of several firms.

¶ Clarify the questionnaires to indicate whether it is talking about the "estimated total cost" or "total cost" of the project.

¶ Delete some of the requests for financial data, so a consulting engineer will not be accused of injecting financial topics into preliminary discussions.

¶ The reference to "ability to give bond" should be deleted, since the American Institute of Consulting Engineers standards of conduct



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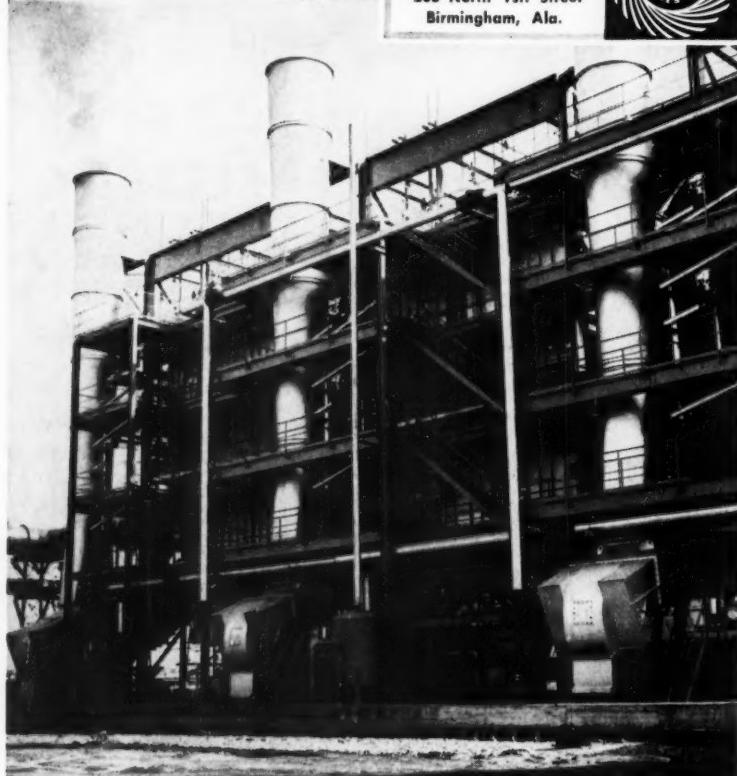
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Because of their unique

design and high erosive resistance, WHIRLEX heavy duty induced draft fans were chosen to handle the hot blast furnace gas. The three units shown here carry approximately 150,000 cubic feet of gas per minute. Preliminary fan examinations show wear to be less than a third that of ordinary fans designed for this purpose.

*A Whirlex fan installation
may solve your problem.
Write or wire us.*



state "A member will decline to give bond for the faithful performance of engineering services, unless required by foreign practice."

¶ Provide space on the questionnaire for listing of professional service records.

All constructive suggestions!

But ICA did not wait for the EJC suggestions and went ahead with the printing of questionnaires as originally prepared.

Salary Basis

The U. S. Court of Appeals for the Ninth Circuit has reaffirmed that a professional employee is one paid a salary, and an employee paid on an hourly basis is subject to the Wage-Hour Law.

The test case was brought by a number of employees asking back pay for overtime, claiming that although they were engineers, the work was "very elementary or simple draftsmen's work."

Upstate or Down?

The New York State Society of Professional Engineers is to be dispossessed within the next year, and one of the big questions currently under consideration is the location of new quarters -- New York City (as at present) or Albany (to be nearer the origin of legislation). The present NYSSPE headquarters site, the Grand Central Office Building, is scheduled for demolition to make way for a 54-story skyscraper.

Another question will enter into the discussion. More than one year ago, NYSSPE dispensed with the position of executive director for financial reasons. Now that the Society again is operating in the black (though just barely), will a new executive director be hired?

Prior to a recent annual meeting in New York City, a special committee to investigate housing facilities had been appointed. The committee came up with one suggestion -- an option on property owned by the State Republican organization in Albany -- to the ap-

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for weeks at 75° C below zero!



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parent surprise of some members. Since the option expired within a few days after the meeting and the move had not been discussed at length before the Board, no action was taken.

Leigh St. John, who completed his term as president at the New York meeting, said, "We will move to Albany only if we get a suitable executive secretary who could spend the necessary amount of time working with the legislators. And

then only if we can find suitable space." So NYSSPE will "stand pat" until the Fall meeting.

Another matter discussed at the recent meeting was the State Employment Service, formed last December and operating on a non-profit basis on contributions from employers and registered engineers placed in jobs.

At first, it had been mentioned that the Service would match consulting engineers and clients, for

no more than "voluntary" contributions. This idea was rejected not long after the Service started.

After consideration by NYSSPE attorneys, the entire concept of employment for contributions was dropped. Tax considerations and such. Now the Service is to be operated strictly as a Service, with no fees or contributions accepted.

Recently, seven "Rules of Unethical Conduct" (see "Heard Around Headquarters", June 1959) written by NYSSPE were adopted by the State Education Department for purposes of administering the laws. Two more rules were suggested. One was adopted, terming unethical the "Failure, without adequate cause, to carry out a project on which a registrant has been retained or failure to advise a client, within a reasonable time, whenever he is unable to proceed with a project which he has accepted."

Agreement was not forthcoming on a second suggested rule: "Directly or indirectly in any manner or by any means splitting any fee or any charge with any person or persons not duly licensed as professional engineers and/or registered architects." This measure met with some opposition, and it is to receive further study.

However, the New York engineers did agree that the architects could use rules on ethics too. It was voted to suggest to the State Education Department that consideration be given to the compilation of a similar set of commandments for the architects.

In other actions:

Functional Sections—Charters were adopted for Functional Sections of Engineers in Industry and of Engineers in Private Practice. Already a functional section has been formed for Engineers in New York City Public Service "for the purpose of encouraging employees of the City to adopt a professional approach toward employment interests and to ward off attempts by unions to organize them for collective bargaining purposes." Next on

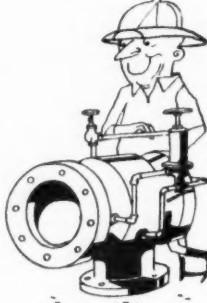
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"CHC" is a compact fan coil unit for mounting between-the-studs of a wall structure, designed to meet the smaller space and capacity requirements of motels, hotels, apartments and residences. Together with Heat-X Package Water Chillers, Dunham-Bush Pumps, and Water Savers, all the necessary equipment to meet complete specifications are provided.

Dunham-Bush "CHC" units are available in two basic sizes—Model CHC-150 and CHC-300. The standard unit is basically designed for free standing use readily adaptable for semi-recessed applications. Each standard unit can be wall mounted, fully exposed or semi-recessed, as required for "off the floor" installations. Matching trim pieces are available for finishing purposes on semi-recessed applications.

Other available features include fresh air wall boxes to meet ventilation requirements calling for the introduction of fresh air up to 20% of the rated CFM; rear discharge sections and grilles to permit discharge of up to 50% of the rated CFM to adjacent rooms where the standard unit is installed on a common interior partition.

Keep up-to-date on the latest! Write for complete "CHC" specifications or call your Dunham-Bush sales engineer.

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the agenda — possible enlargement of the New York City group to accept Federal and state employees. *Urban Planning* — Some time ago the Division of Economic Development of the New York State Department of Commerce issued a circular which included a list of "Planning Consultants," supposedly qualified to work under the Urban Planning Assistance Program. NYSSPE voted to notify the Department of Commerce that if a

list is to be circulated, it should be a complete list. The engineers also would like the Department to state in the booklet that those portions of urban planning involving engineering may, under N. Y. State law, be performed only by engineers. "Junior Members" — It is becoming unstylish to be called "junior" in any engineering group. The American Society of Civil Engineers recently revamped its entire membership rating to eliminate young engi-

neers being called "junior." Now NYSSPE has received a proposal to change its junior members to associates. This was referred to the Engineers-in-Training Committee. *More Dues* — The NYSSPE membership has voted to allow a dues increase. The vote gives the Board permission to raise state dues from the present \$10 to a maximum of \$12 per member.

Tax Employee Expenses?

The Internal Revenue Service is thinking about taxing living expenses of employees on out-of-town jobs. While living costs are deductible on temporary assignments, there may be many future conferences on how long is temporary. Proposed procedure would be for the taxes to be collected from the employer, letting the employee make any claims for a refund.

Unfinished . . .

For awhile, the 17th and 18th floors of the new engineering headquarters building were to be left unfinished. The American Society of Civil Engineers objected, because the Civils wanted the top two floors. They suggested the second and third floors would be easier to get to for finishing at a later date. At last report, the United Engineering Trustees had decided that the 15th and 16th floors may be left uncompleted for the time being.

Advertising?

American physicians do not advertise, but they sometimes get paged at ball games. U. S. engineers do not advertise, either, but some of them keep their names before the public by constantly placing large employment ads. Or so it is said.

T. M. Medland, executive director, Association of Professional Engineers of Ontario, said, "Many of us have noted this big advertising approach by U. S. firms, even when the companies concerned were known to be laying off engineers. It could be a tax-free method of advertising the company." ▲▲



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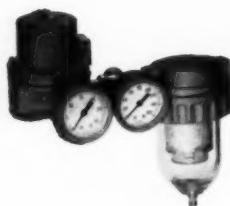
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The Legal Aspect

MELVIN NORD, P.E.

Consultant in Legal and Technical Problems
Patent Attorney

The Law of Real Property: Bridges

BRIDGES, generally speaking, are regarded in law as part of the roads on which they are located, so the law of highways (*CONSULTING ENGINEER*, July 1959) in general applies to bridges as well, except insofar as it is affected by statute. Therefore, we shall use a few recent cases to illustrate the laws relating to bridges in practice.

Bridge Repairs

State ex rel. Summers v. Sims, 97 S.E. 2d 295, involved a proceeding to compel the State Auditor to pay \$14,300 for claims against the State Road Commission arising out of its alleged negligence in the construction and maintenance of a highway bridge. The money already had been appropriated by the Legislature, but the State Auditor refused to pay, on the ground that the State had no moral obligation to pay, since the damage had been caused by an "Act of God" — a flood caused by unusual rainfall.

The plaintiffs resided in a valley, with a State road on one side and a creek on the other. At the edge of their property, the road made a sharp turn, crossing the creek.

In 1942, the Road Commission built a fill across the valley, as an approach to a bridge which it constructed across the creek. The fill was about 6-ft high, and the bridge was 34-ft long and 10-ft high. Of wooden construction, the bridge had two end abutments pile-driven into the ground, and a bent lo-

cated approximately in the center with three poles set on a mud sill about a foot wide. Stringers ran from the end abutments to the center bent, and 3-in. boards laid on the stringers. It became necessary from time to time to repair the bridge, and in so doing the Road Commission placed additional supports between the end abutments and the center bent, reducing the areaway for the passage of water beneath the bridge. Debris therefore lodged against the supports, creating a dam in the stream.

In 1957, there was a heavy rain in the drainage basin of the creek, and the stream was so flooded that it backed up around the house and lifted it from its foundations. The bridge washed out and the house was broken apart. Anna Summers and her two sons were thrown into the water; the mother drowned, and the two sons sustained injuries.

The Court held that the Road Commission had been negligent, and a damage action would have been available at law against the state except for its immunity to tort actions. Thus, there was a moral obligation to pay the damages and the Court ordered the State Auditor to do so.

An Overloaded Bridge

Commonwealth of Kentucky v. Ragland Potter Co., 305 S.W. 2d 915, was an action by the State Highway Department for \$11,000 damages to a highway bridge, a

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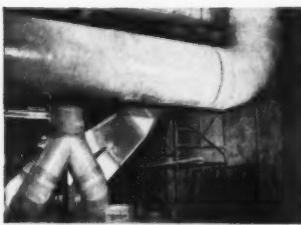
Note how spirals in cross bars alternate right and left and are slightly raised above bearing bars for an extra margin of safety.

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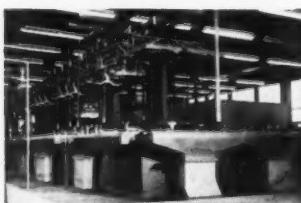
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45-year old span of 270 feet which collapsed when the defendant drove an 8-ton truck carrying a 2-ton load onto the bridge, despite a posted 5-ton limit.

At the trial, the defendant showed that he had driven the same truck with substantially the same load over the bridge a few hours earlier, without collapsing it.

The case was sent to the jury, over the objection of the Highway Department, which claimed that there was no need for a jury determination of facts because the defendant was negligent as a matter of law for overloading the bridge. The jury gave a verdict for the defendant, and this verdict was upheld on appeal. The appellate court said that there was no way to tell whether the bridge had collapsed because of the overload or for some other unknown reason.

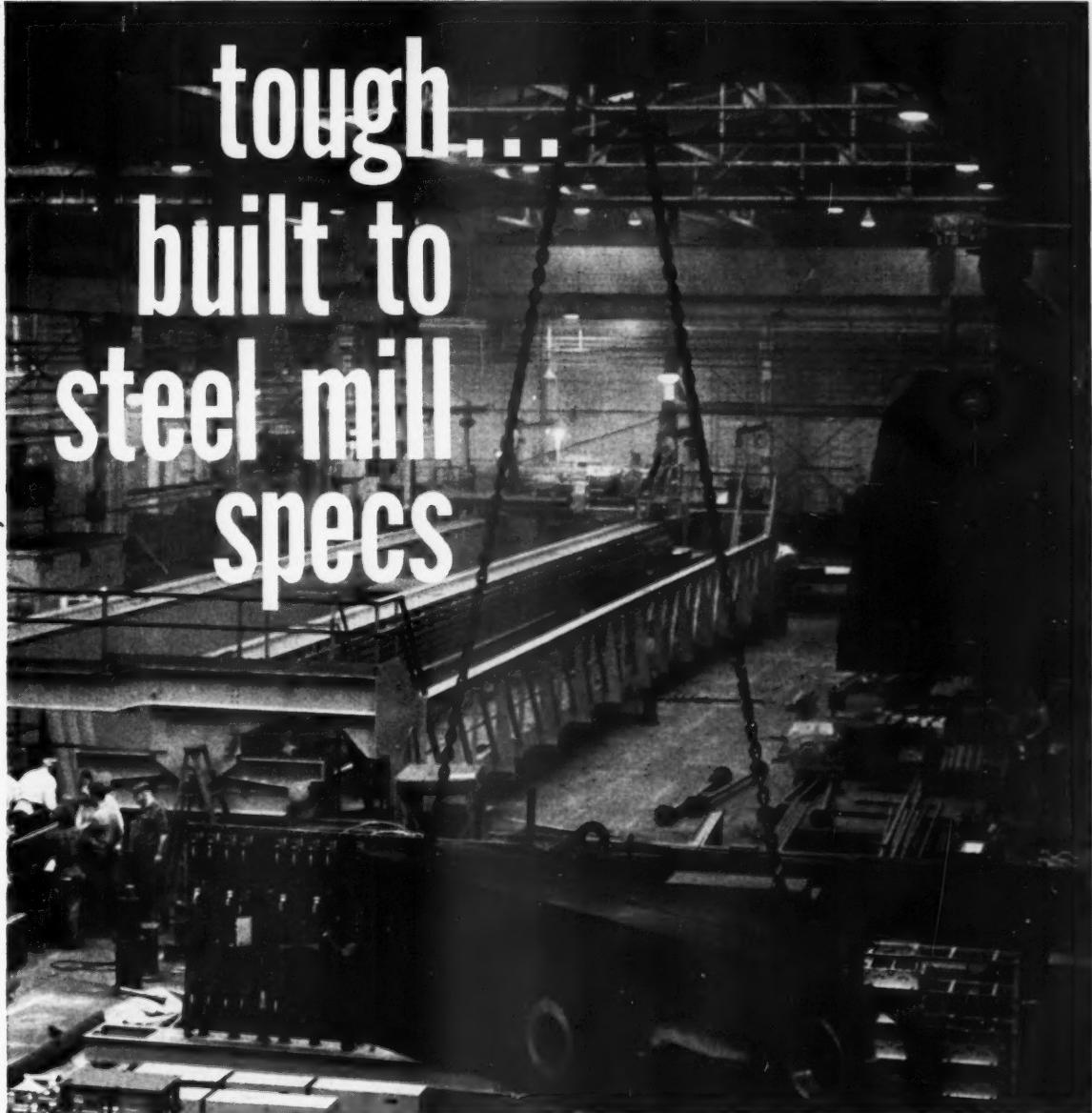
Bridge Approach

Nicholson v. City of Des Moines, 60 N.W. 2d 240, involved the liability of a city for injuries to a pedestrian who fell from a public walk, serving as a bridge approach, into an adjacent unguarded pit.

The present bridge across Four Mile Creek in the City of Des Moines is located a few feet south of the location of the original bridge. Originally, a cement sidewalk led straight across the bridge, but when a new bridge was built, the City built a cinder path curving southward to connect with a sidewalk on the new bridge. The cinder path was about 6-ft wide, and without definite margins.

The accident occurred late at night, when a light snow was falling, and it was very dark. The pit into which Winfred Vincent, aged 72, had fallen was in the west bank of the creek, 12 feet from the cinder path, and in a direct line from it. The pit had been formed by the washing away of the soil by water discharging from an 18-in. concrete pipe installed by the City to carry surface water from a ditch on the side of the cinder path. The walls

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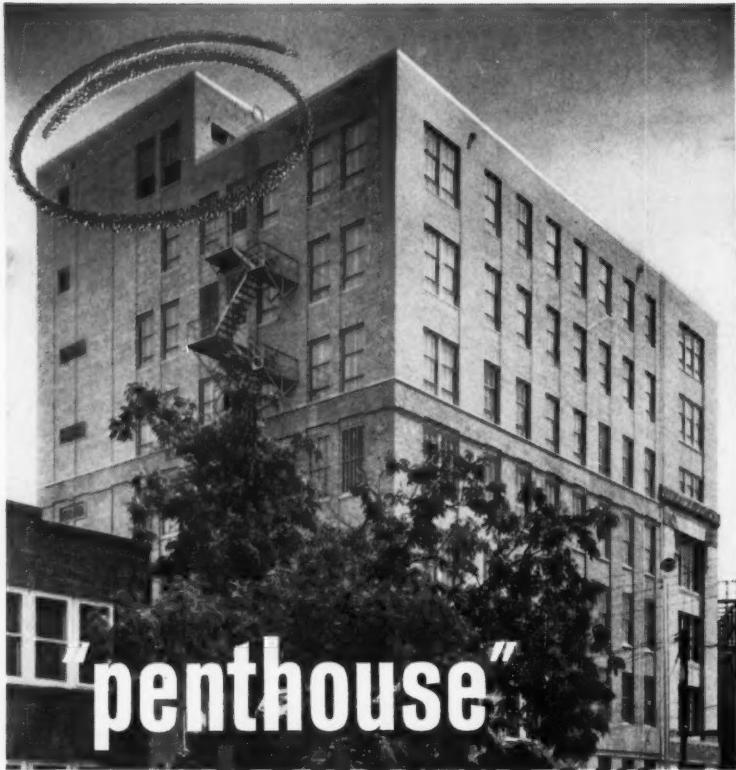
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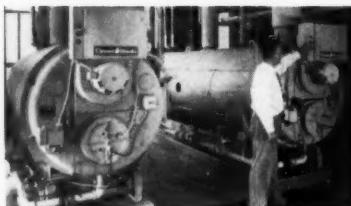
Cleaver-Brooks boilers at Lone Star Gas Company, Ft. Worth, Texas, demonstrate advantages of compact design and reliable, low-cost operation in year-round dual use of steam

The installation — these two Cleaver-Brooks 100-hp gas-fired boilers in penthouse boiler room atop eight-story office building, according to A. E. Emmet, Industrial Engineer, "are providing all steam needed for both heating and cooling of the entire building."

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divided responsibility for the design of a package-type boiler always works out to the customer's advantage and all parts are built to work as a unit."

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of the pit — 10 to 15-ft deep and 8-ft wide — were precipitous. There was no barrier guarding the pit, no street light nearby, and the path was obscured by snow.

In the trial court, the judge directed a verdict for the City holding that a pit 12 feet from the public walk was not a part of the public street or highway and that therefore there was no duty on the part of the City to maintain barriers guarding the pit. This decision was reversed on appeal. The appellate court said that there is no specific distance from a public street or highway beyond which the City's liability ceases. So long as the hazard is one which is intimately connected with travel along the public path, the City continues to be liable for negligence.

Toll Bridge

Bettencourt v. State of California, 266 P.2d 201, involved the question of liability of the State for its negligence in operating a lift bridge.

The State of California maintained a toll bridge and highway between the counties of Alameda and San Mateo. On a certain day when the lift span was raised, no warnings were given or barriers raised, and the plaintiff's car ran into a steel and concrete center roadway injuring the plaintiff.

The plaintiff argued that, although the operation of public highways and bridges is normally a governmental function, the fact that tolls were charged in connection with the operation of the present bridge made this a proprietary activity. The court, however, held that the imposition of a charge for service is not inconsistent with the exercise of a governmental function. The test is whether the particular activity in which the governmental agency is engaged at the time of the injury is of a public or of a private nature. The bridge was a part of the State's public highway system, and thus a governmental operation, so the State was held to be immune from liability. □

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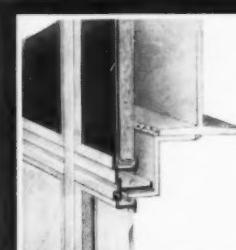
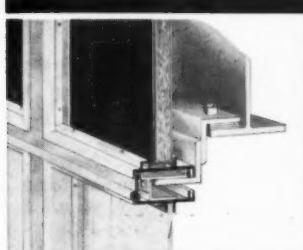
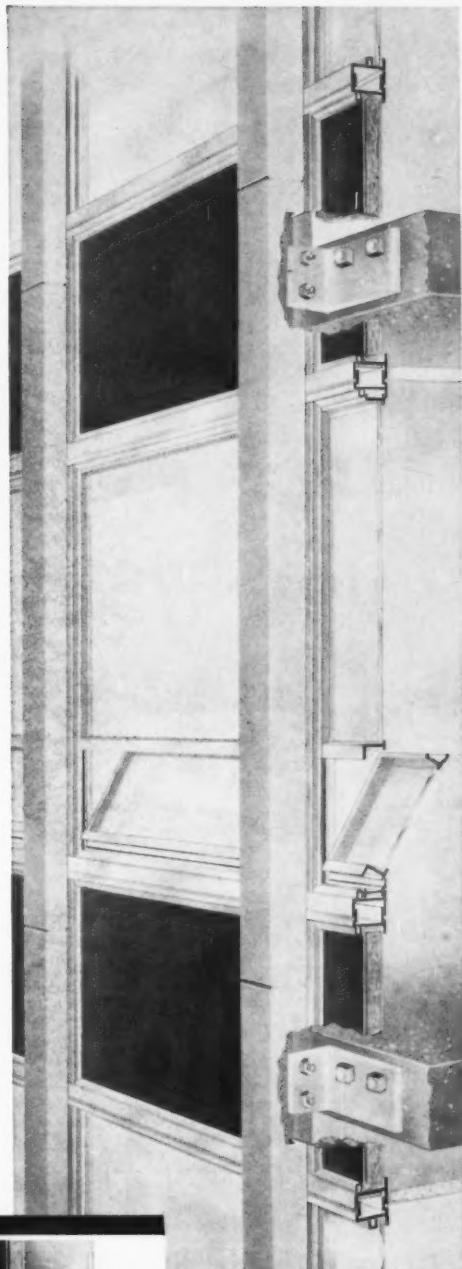
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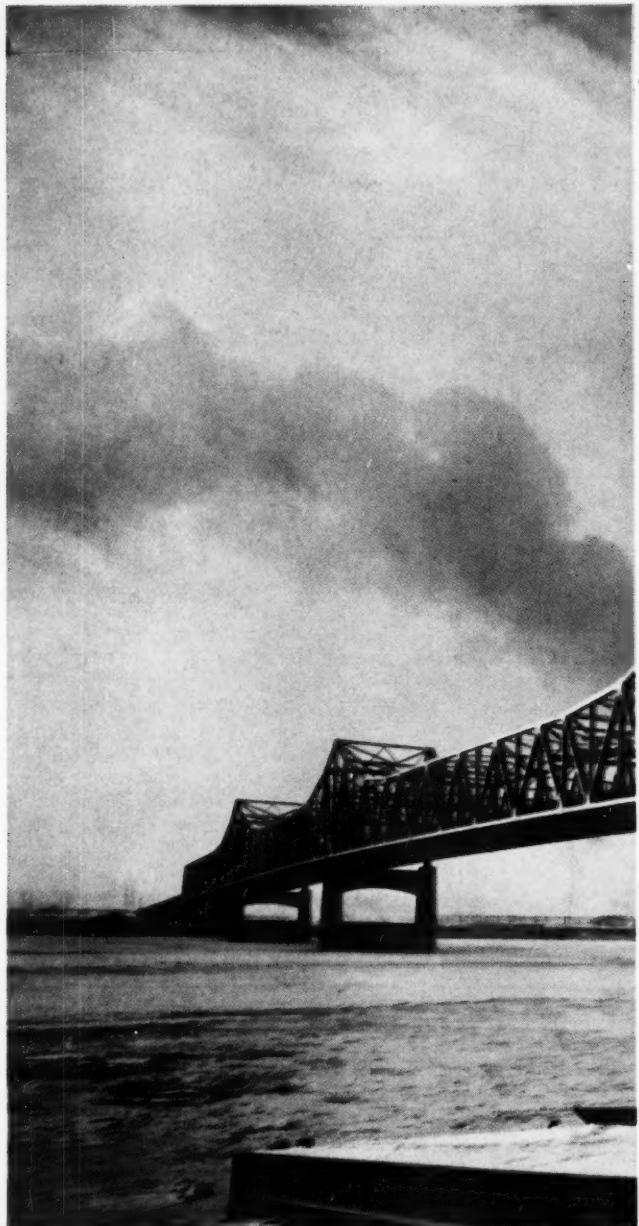
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Five-span cantilever bridge, Peoria, Illinois, carrying two 26-foot roadways. Total length of spans—2,340 feet. Designer: State of Illinois, Dept. Public Works and Buildings, Division of Highways. Fabricator: Allied Structural Steel Cos. Erection by Industrial Construction Co.

\$175,000 was saved by the use of USS TRI-TEN Steel in heavily stressed chords and diagonals, where it eliminated 850 tons of deadweight.



This spanking new Illinois River Bridge at Peoria takes advantage of the cost-saving features of high strength steel. USS TRI-TEN Steel was used wherever it would save money—and this was in most of the chord members and about 70% of the diagonals. These parts could be made thinner and lighter because of TRI-TEN Steel's minimum yield point of 50,000 psi. The bridge is all of 850 tons lighter than conventional construction would have been.

From 20 to 40% less steel was used in the high-strength low-alloy steel members. Less complicated members and fewer side plates was another consequence of using TRI-TEN Steel, leading to lower fabrication and erection costs—and,ulti-



mately, fewer maintenance problems. It is estimated that \$175,000 was saved by using TRI-TEN Steel.

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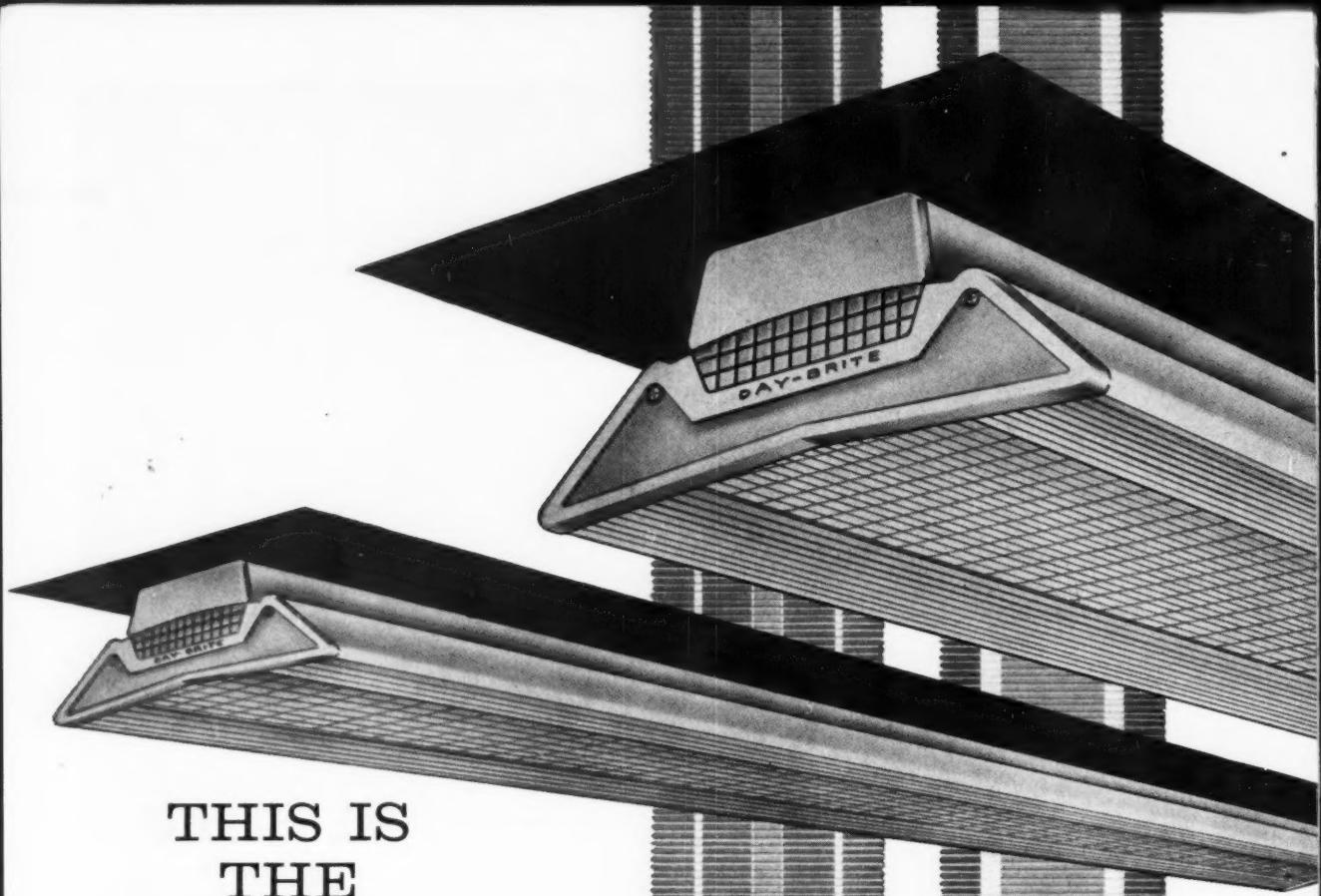
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The Word From Washington

EDGAR A. POE
Consulting Engineer Correspondent

A HOUSE-PASSED PROVISION that would have placed a 5 percent limit on engineering and design costs, on any Department of Interior construction project, was killed in conference between House and Senate appropriation conferees. The proposed engineering and design cost ceiling was approved first by the House Appropriations Committee and subsequently sanctioned by the House, but the Senate Appropriations Committee deleted it.

In so doing, the Senate committee said it concurred with the House action to reduce what it called "excessive engineering and design costs." However, the committeemen said a 5 percent ceiling on each project not only would fail to accomplish the desired result, but refusal to provide adequate engineering and blueprinting could greatly swell construction costs.

Power Demand Growth

Under Secretary of the Interior Elmer F. Bennett summed up the Eisenhower Administration's electric power policy this way. Full devel-

opment of water resources in the United States is too big a job for any segment of government (Federal, state, or local) or private industry to undertake alone. The policy of the Federal government is to encourage development by those who are willing and able to meet the needs as they arise. Nor does the government believe that Federal development is necessarily better development.

Peering two decades ahead, the Under Secretary said electric energy requirements for 1980 may exceed 2150-billion kilowatt hours. This is more than three times the power used in 1958.

Aid for Africa

Senator John F. Kennedy of Massachusetts, one of the Democratic party's front running presidential candidates, is planning to visit Africa this fall, in connection with his efforts to provide more economic and technical aid for that continent. Chairman of the Senate Foreign Relation Subcommittee on African Affairs, Senator Kennedy



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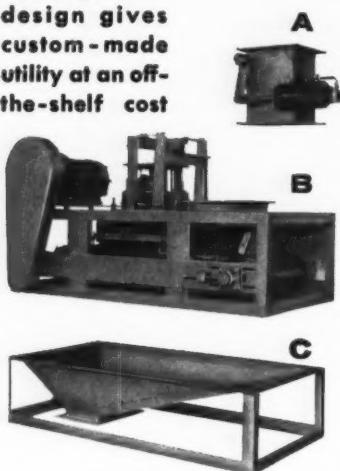
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maintains the Africans are more interested in development than in East versus West doctrine. Furthermore, he said Africa is moving rapidly from the feudal stage to the atomic age.

Inter-American Technical Aid

The Inter-American Development Bank appears destined to become an important link in the program of cooperation between the United States and the other American Republics. All member countries will share in providing the basic capital for the institution. The bank is scheduled to have a basic capital of \$850 million plus an additional \$150 million for special operations such as planning and other technical aid supplied by engineers.

Utility Investments Revised

The nation's public utilities now are planning 1959 investments at about 3 percent less than 1958. The amended forecast of expenditures is a mild surprise. Electric utilities will invest slightly less than was expected in early spring, while natural gas companies will spend a little less than in 1958, but slightly more than the original forecast.

The Commerce Department said the downward adjustments in the latest annual program of electric utilities may simply reflect a closer estimate of construction costs rather than elimination of specific projects. The reduction in gas company programs is attributable to lowering of sights by a few large pipeline companies.

Small Cars Affect Tax Collection

Both Capitol Hill and some of the officials of the executive branch of the government are watching with more than casual interest as Detroit's big automobile makers enter the small car field. Smaller cars and fewer refinements mean less Federal taxes to the Treasury.

Despite the retreat of the manufacturers from the long-time accepted philosophy of bigger, roomier, and flashier automobiles, of

ficial Washington is not expecting any dramatic trend to take place for the next several years. Meanwhile, small car imports continue to increase. Official Washington expects the small car is here to stay as city traffic congestion increases.

Boom Continues

Construction contractors are increasing their equipment purchases over 1958 as the result of the high rate of over-all construction activity. Retail trade companies are expanding store modernization programs, and blueprinting plans for new shopping centers.

Jet Age Airport

Engineers are continuing to make changes as new problems crop up in the construction of the world's most modern jet age international airport which will be opened in 1961 at Chantilly, Virginia, 18 miles from downtown Washington. When completed the project will cost more than \$100 million. Congress already has authorized \$90 million.

Meantime, engineers are planning metropolitan Washington's first eight-lane expressway to serve the great airport with the Blue Ridge Mountains of Virginia in the background. However, the eight-lane access highway will not be completed until a few years after the airport is in operation.

Highway Program Problems

Highway construction prospects the remainder of the summer and autumn months will be the greatest of all time. However, a disruption in the Interstate Program, assuming there is a curtailment in activity, will have its impact.

Many consulting engineers, whose services have been employed by the various state highway departments as a result of the accelerated program, would have their services suspended. Regardless of what happens, however, the primary, secondary, and urban programs — the 50-50 dollar matching programs — will in no way be af-

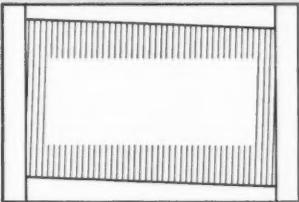


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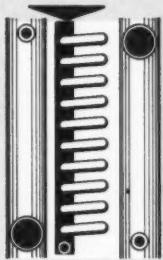
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Get complete information on Nesbitt Type WD surface with all the benefits of conventional continuous tube water surface *plus complete drainability*. Write for Pub. 302.

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fected. These so-called ABC programs have priority over the Interstate System on which the Federal government supplies 90 percent of the funds and the states 10 percent.

Obviously, disruption in the Interstate System would sharply affect the asphalt, cement, sand, and gravel industries. Many contractors would reduce the number of employees. Approximately 24 percent of all portland cement, 70 percent of asphalt production, 50 per-

cent of sand and gravel, and 12 percent of structural steel are used for highway purposes.

Stream Pollution

Congress is taking cognizance of the growing stream pollution problem. While the lawmakers were considering an accelerated anti-stream pollution program, it now appears that the existing \$50 million a year Federal contribution program to aid communities will

not be doubled because of the threat of a presidential veto in view of the Treasury Department's fiscal headaches. The House-passed bill by Minnesota's Representative John A. Blatnik would have provided \$100 million a year for 10 years. At the same time it would have raised the ceiling on Federal contributions to individual projects from \$250,000 to \$500,000.

Airport Grants Hold Steady

Federal airport grants appear fairly certain to be increased by Congress within the next year or two, unless some unexpected emergency arises. Meantime, grants will continue at the present rate of \$63 million a year until June 30, 1961. This modest appropriation for the next two years represents a tremendous retreat from the \$465 million and \$297 million appropriation bills passed originally by the Senate and House, respectively. Both bills called for four-year extensions. The Senate and House gave ground after President Eisenhower warned that he would veto them.

Can Restrict Materials

In a memorandum, Federal Highway Administrator Bertram D. Tallamy has explained that states do have the power to restrict the use of materials from foreign countries, so long as the restrictions do not exceed restrictions applied to Federal construction.

Tallamy draws this conclusion from a 1954 Executive Order, implementing the Buy American Act of 1933. The Act permits the use of materials from other nations if a savings of at least six percent can be proved.

Building Sites Grow Scarce

With the supply of suitable residential lands for development diminishing, soil surveys in proposed residential developments are becoming more important to engineers. The Federal Housing Administration soil scientist, Elvin H. Henry, said the rapid growth of many cities is

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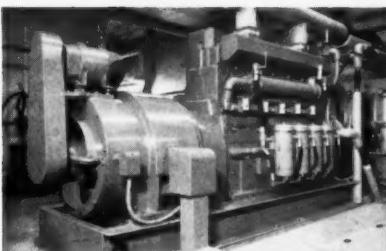
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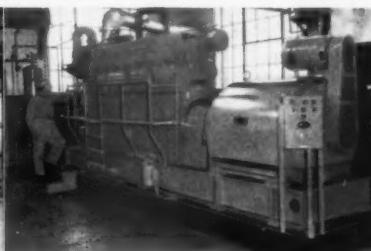
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ALBUQUERQUE, NEW MEXICO . . . Superior 6G-825 gas engine generator set (250 KW) at Sewage Disposal Plant No. 1. Engine operates on sewage gas and/or natural gas.



LIMA, OHIO . . . Superior 40-SX-8 diesel engine generator set (500 KW) at city waterworks. Unit is on duty as standby power.



TUCSON, ARIZONA . . . Five Superior 80-GDSX-8 dual-fuel engine generator sets (each 1000 KW) at TRICO Electric Co-op Inc. County-wide power for farming and residential requirements.

bringing into residential use acreage heretofore regarded as unsuitable for home building. Based on sound engineering practices, numerous land developers and builders are using these areas to the best advantage.

Bureau of Mines

Director Marling J. Ankeny, of the Bureau of Mines, says his agency is ready to assist in the development of engineering materials

necessary to harness nuclear energy. Furthermore, he said the Bureau has the trained men and engineering know-how to aid in disposal of atomic wastes by deep earth burial.

As government agencies go, the Interior Department's Bureau of Mines is relatively small and operates on a budget of \$27 million a year. Primarily a technical organization, it employs 4300 people of whom more than 1200 are engi-

neers and scientists. Approximately two-thirds of the Bureau's appropriation is devoted to conservation and development of metal, mineral, and mineral-fuel resources.

New Census Plans

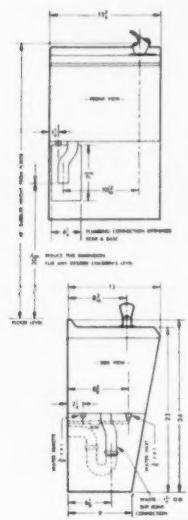
The Bureau of Census is completing plans for the decennial census of population to be taken as of April 1, 1960. About 25 inquiries, two-thirds pertaining to social characteristics, and the remainder to economic characteristics such as work status, occupation, industry, and income, will be covered. This is the first time the census will include questions on place of work and means of transportation.

Upon completion, the census will provide both industry and government a better line on the whereabouts of engineers. Persons in 10 separate branches of engineering will be counted. However, the Census Bureau has advised Congress that the information it will gather will not supply all the information needed for a detailed listing of engineers and scientists.

The census of housing, which the Bureau of Census will conduct next year, will include 35 inquiries. Among new topics to be covered will be air conditioning units, water heating fuel, home food freezers, clothes washing machines, clothes dryers, number of bathrooms, source of water supply, and method of sewage disposal — the latter two being omitted in places of more than 50,000 population.

Coal Road Binder Studied

The Bureau of Public Roads and engineers will watch with marked interest the research being undertaken by the Pennsylvania and Kentucky highway departments on use of coal as a binder material for roads and airport runways. Pennsylvania actually will build links of roads using coal as a binder material, while the Kentucky Highway Department has signed a \$200,000 contract for an extensive research program.



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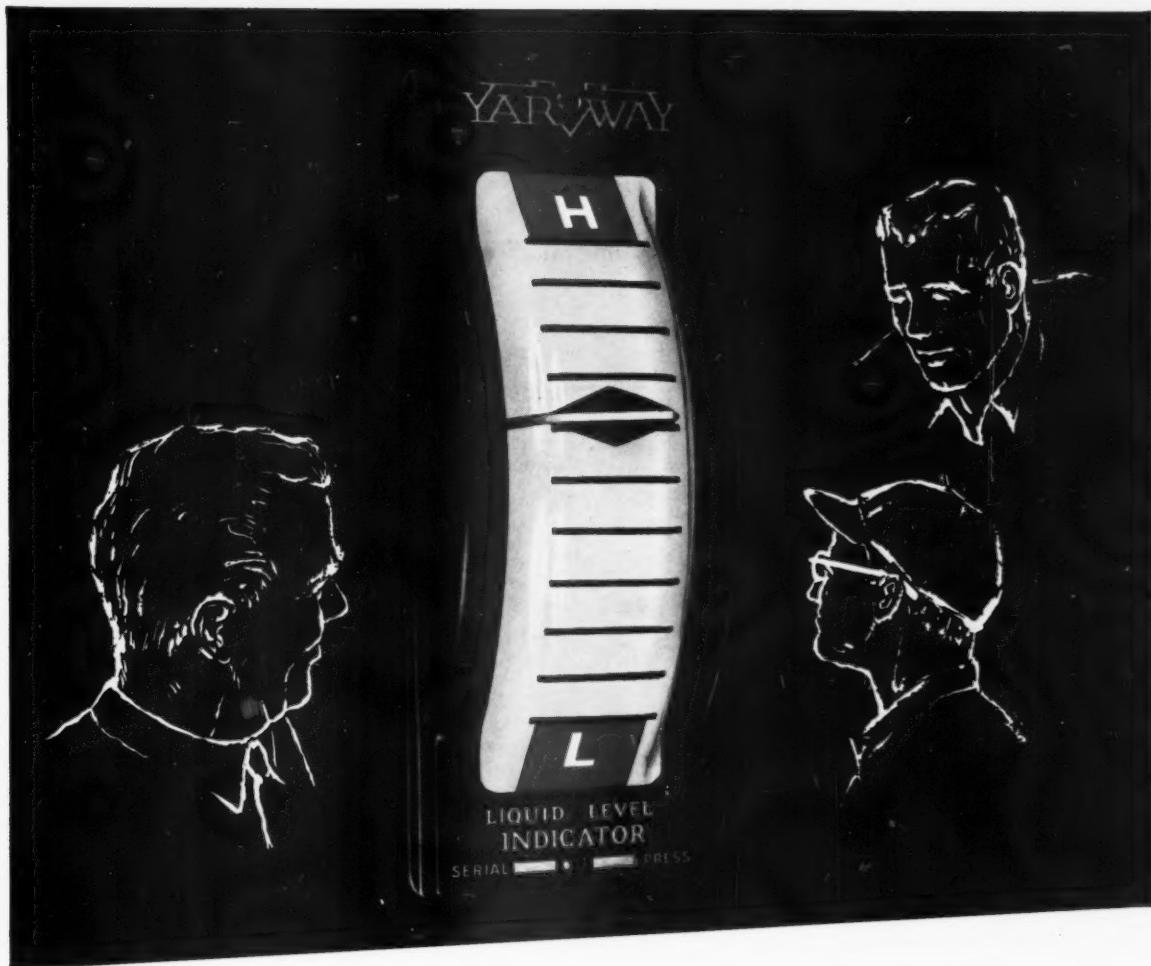


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An Economic Investigation . . .

The Gas Turbine-Steam Turbine Cycle

I. GABEL, Supervising Mechanical Engineer
Burns and Roe, Inc.

COMPARED TO MODERN conventional steam power plant cycles, the combination of a gas turbine with a steam

C_E exclusive

turbine offers significantly improved thermal plant efficiencies. The two basic types of combination cycles for large steam power plants presently worthy of consideration are:

- ¶ The supercharged cycle
- ¶ Exhaust heat recovery cycle using gas turbine exhaust gas as steam generator combustion air

Cycle Characteristics

With the supercharged cycle, the steam generator is put under a pressure of 5 or 6 atmospheres with air from the gas turbine compressor. The high-pressure, high-temperature 1350-1450 F exhaust gases from the steam generator then are expanded through the gas turbine. Then, the hot exhaust gases from the gas turbine are used for feedwater heating. Plant heat rate gains of approximately 5 to 8 percent over modern conventional steam cycles are possible with this supercharged cycle. The exact gain depends upon the combination cycle arrangement and the efficiency level of the conventional cycle. The higher the thermal efficiency of the conventional cycle, the lower will be the plant heat rate gain of the combination cycle. However, heat rate gains of approximately 5 percent can be expected with a supercharged combination cycle superimposed on a conventional steam cycle that operates with supercritical steam pressures and double reheat.

The supercharged combined cycle has not been adopted by the utility industry, primarily because of the difficulty of cleaning the steam generator exhaust gases before they enter the gas turbine. Considerable research is being carried on with coal-fired gas turbines in an effort to achieve the high standards of reliability and continuity of operation required for electric power plant application. Also, the supercharged steam generator design must be radically different from that of a conventional unit. The leading boiler manufacturers have been studying this and have made preliminary de-

signs. One manufacturer has built two small test units of 5000 lbs per hr steam capacity each and a third test unit of 140,000 lbs per hr steam capacity. These operate on gas and distillate oil.

In the second type of combination gas turbine-steam turbine cycle, the gas turbine exhaust gases, at high temperature and containing considerable oxygen, are used as combustion air for the steam generator. The gas turbine replaces the forced draft fans and air preheater. Otherwise, the steam generator is of the conventional design. The exhaust gases from the steam generator are used for the steam cycle feedwater heating. With this type of combination cycle, plant heat rate gains of 1 to 4 percent are possible, over modern conventional steam cycles operating with reasonably high steam pressures and temperatures. As in the supercharged cycle, the exact gain depends upon the cycle arrangement and the efficiency of the conventional cycle.

Although most of the components of the exhaust heat recovery cycle can be of the conventional tried and tested types, the integration of the units into a smoothly functioning system is new. There are two exhaust fired combination cycles under construction or in operation in the electric utility industry at the present time:

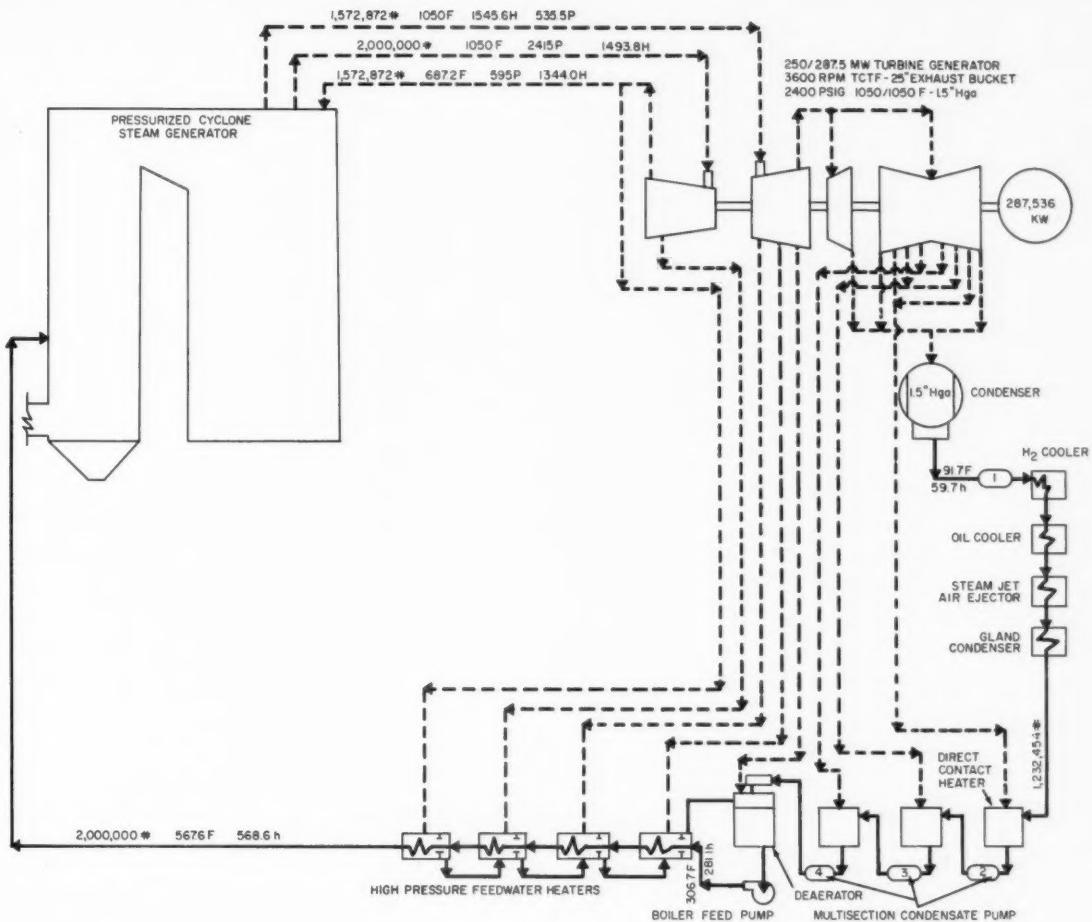
- ¶ The Warwick Station, of the Crisp County Commission of Georgia, went into operation in 1958. It includes a 5000-kw gas turbine and a 12,500-kw steam turbine.

- ¶ The Rio Pecos Power Plant, of the West Texas Utilities Company, is presently under construction. It also has a 5000-kw gas turbine, but the steam unit is rated at 33,000 kw.

There are other similar type cycles in operation or under design for industrial plants.

Evaluation Study

Burns and Roe, Inc., recently undertook a study for a utility to determine whether an extension to a modern, high efficiency steam plant should essentially duplicate the existing plant or whether the existing steam plant should be combined with


COAL FIRED

GROSS OUTPUT 287,536 KW
 TURBINE HEAT RATE 7612 BTU/KWHR
 AUXILIARY POWER 16,931 KW
 NET OUTPUT 270,605 KW
 BOILER EFFICIENCY 90.40 %
 NET HEAT RATE 8,860 BTU/KWHR

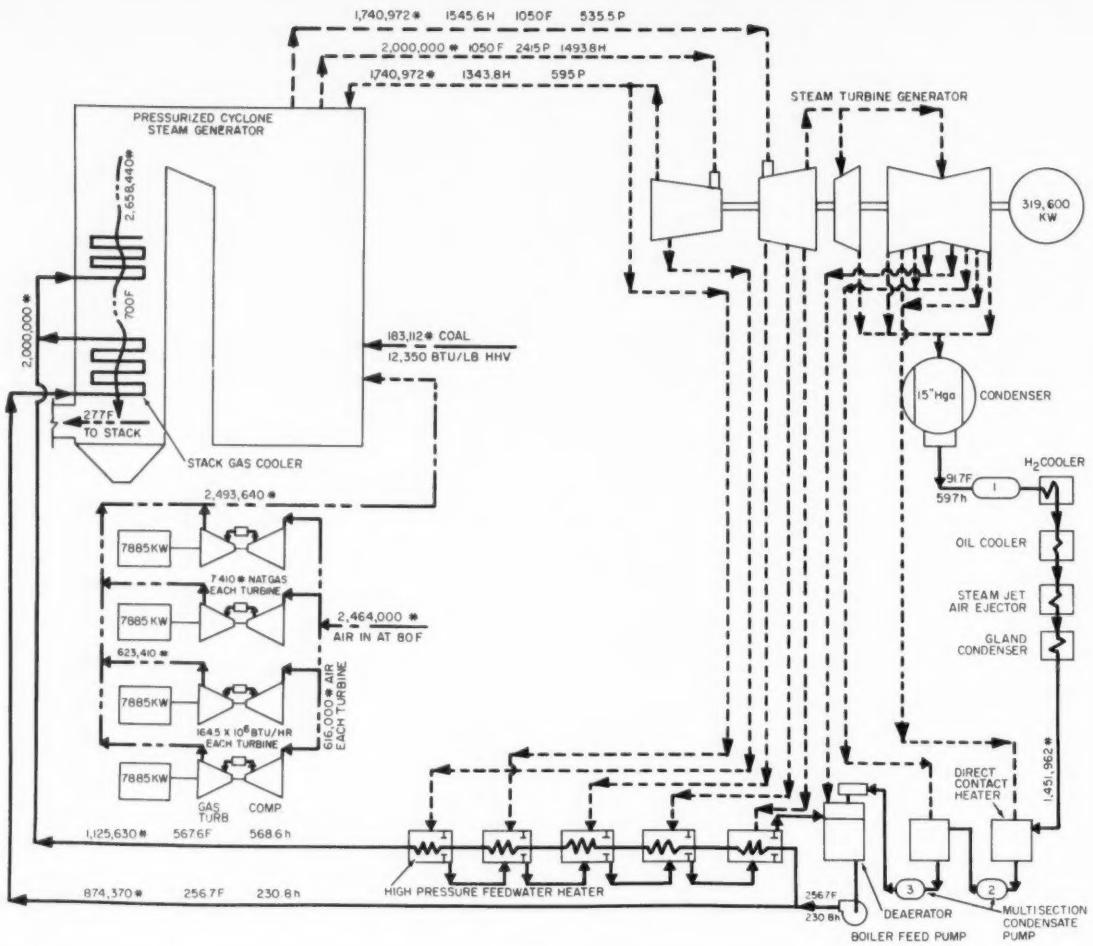
GAS FIRED

GROSS OUTPUT 287,536 KW
 TURBINE HEAT RATE 7612 BTU/KWHR
 AUXILIARY POWER 15,917 KW
 NET OUTPUT 271,619 KW
 BOILER EFFICIENCY 84.76 %
 NET HEAT RATE 9,415 BTU/KWHR

LEGEND

- P PRESSURE, PSI ABSOLUTE
- L LIQUID ENTHALPY, BTU/LB
- H VAPOR ENTHALPY, BTU/LB
- * FLOW, LB/HR
- V SPECIFIC VOLUME, CUFT/LB

FIG. I -- HEAT BALANCE FOR CONVENTIONAL STEAM CYCLE



GROSS GENERATION 35,140 KW
 STEAM CYCLE LOAD 319,600 KW
 GAS CYCLE LOAD 31,540 KW
 AUXILIARY POWER 12,930 KW
 NET GENERATION 338,210 KW
 NET PLANT HEAT RATE 8,632 BTU/KW HR

FUEL
 STEAM GENERATOR - BITUMINOUS COAL
 GAS TURBINE - NATURAL GAS

LEGEND
 — LIQUID
 - - - STEAM
 - - - AIR
 - - - PRODUCTS OF COMBUSTION

* FLOW, LBS/HR
 P PRESSURE, PSI ABSOLUTE
 H VAPOR ENTHALPY, BTU/LB
 h LIQUID ENTHALPY, BTU/LB
 F TEMPERATURE, °F

FIG. 2 -- HEAT BALANCE FOR EXHAUST FIRED COMBINED GAS-STEAM TURBINE CYCLE

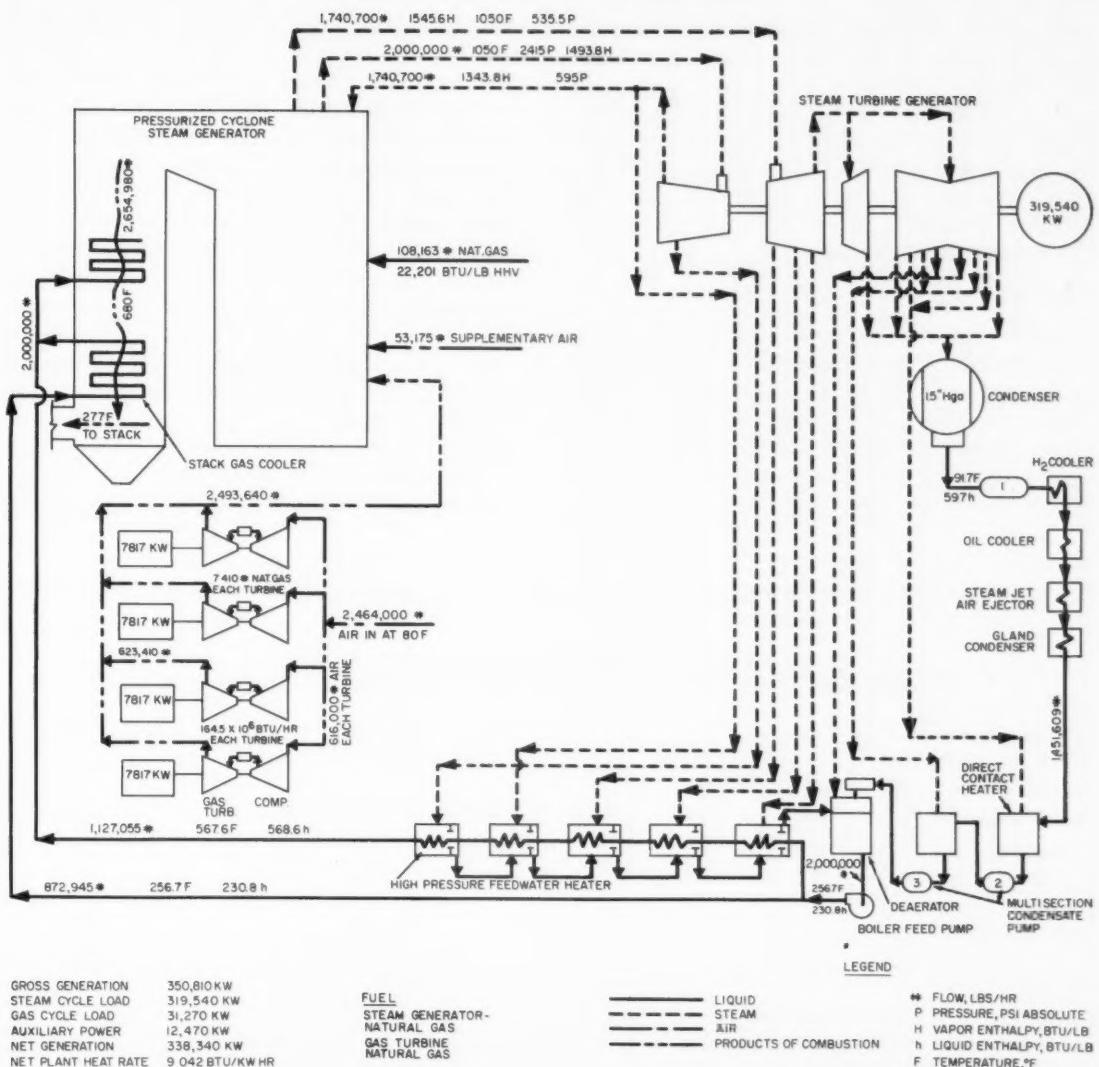


FIG. 3 -- HEAT BALANCE FOR EXHAUST FIRED COMBINED GAS-STEAM TURBINE CYCLE

a gas turbine using exhaust gases as combustion air for the steam generator. Because of the economic advantages of duplicating the existing plant, the installation of a combination cycle was not recommended for this particular project. However, by modifying the results of the study to show a general comparison between a combined cycle of the same kilowatt capacity and a conventional cycle, we can arrive at a realistic general economic evaluation of the combined cycle.

Fig. 1 is a heat balance diagram of the conventional steam cycle used as the basis for the study. The heat balance is for 2-million lbs per hr of main steam (the maximum continuous rating of the steam generator) and for 287.5-mw gross elec-

tric generation. The main steam pressure is 2400 psig, and the temperature is 1050 F with reheat to 1050 F. The steam generator is of the pressurized cyclone type.

For maximum operating efficiency the gas turbine exhaust gas flow should equal the steam generator air requirements in equivalent oxygen. Excessive gas turbine exhaust flow results in increased cycle excess air losses. Also, excessive gas turbine flow results in additional installed gas turbine capacity cost and larger steam generator gas flow passages, with resulting increased steam generator cost. A shortage of gas turbine exhaust flow results in inefficient thermal cycle operation and defeats the purpose of the exhaust heat recovery combina-

tion cycle. In addition, it would be necessary to make provisions in the design for supplementary forced draft air capacity.

It is important, therefore, that the gas turbine be selected to satisfy the steam generator requirements at some optimum point. In this study, the steam generator maximum continuous rating of 2-million lbs per hr steam flow was selected as the optimum operating point.

Sizes Studied

A preliminary examination was made of commercially available standard gas turbines with ratings in the range of 9500 kw to 22,000 kw. We found that four, 9500-kw gas turbines together met the steam generator combustion air requirements at 2-million lbs per hr maximum continuous steam flow. Larger gas turbines, although lower in first cost

than four small ones, could not be matched as well with this steam cycle. Therefore, on a thermal efficiency basis, the four, 9500-kw gas turbines were selected for this study. However, for capital cost estimating purposes in a general evaluation of the combined cycle, we can assume that the steam flow for another plant could be adjusted to more closely match the air flow of two commercially available gas turbines of larger size working together. The estimate of installed plant costs has been adjusted accordingly.

A forced draft blower was included for the combined cycle to provide supplementary combustion air above that available from the gas turbines. This forced draft blower was sized to maintain steam generator peak flow, plus test block margin of 15 percent, plus capacity to provide for the contingency of an outage of one of the gas turbines.

TABLE 1 — SUMMARY OF PERFORMANCE DATA
GAS TURBINE-STEAM TURBINE COMBINATION CYCLE, EXHAUST HEAT RECOVERY TYPE

Alternate Type of Cycle	I-A Conventional Combined		II-A Conventional Combined		III-A Conventional Combined	
	Bit. Coal	Bit. Coal	Bit. Coal*	Bit. Coal	Nat. Gas	Nat. Gas
	—	Nat. Gas	—	Nat. Gas	—	Nat. Gas
Pressurized Cyclone						
Main Steam Flow, lb/hr	—	—	2,000,000	—	—	—
Main Steam Pressure, psig	—	—	2400	—	—	—
Main Steam Temperature, F	—	—	1050	—	—	—
Reheat Steam Temperature, F	—	—	1050	—	—	—
Total Rating of Installed Gas Turbines@ Standard Rating Conditions of 80 F and 1000 ft Elevation, kw	—	38,000	—	38,000	—	38,000
Gas Turbine Inlet Temperature (Throttle), F	—	1450	—	1450	—	1450
Gas Turbine Exhaust Pressure, "H ₂ O gage	—	50	—	50	—	52
 Gross Electric Generation						
Steam Turbine, kw	287,536	319,600	287,536	319,600	287,536	319,540
Gas Turbine, kw	—	31,540	—	31,540	—	31,270
Total, kw	287,536	351,140	287,536	351,140	287,536	350,810
Total Net Plant Output, kw	270,605	338,210	270,676	338,210	271,619	338,340
Differential Net Plant Output, kw	Base	67,605	Base	67,534	Base	66,721
 Net Plant Heat Rate @ 2,000,000 lb/hr Steam Flow						
Heat Addition by Coal, Btu/kwh	8860	6686	7034	6686	—	—
Heat Addition by Gas, Btu/kwh	—	1946	1946	1946	9415	9042
Total Net Plant Heat Rate, Btu/kwh	8860	8632	8980	8632	9415	9042
Differential Net Plant Heat Rate (Coal plus Gas), Btu/kwh	Base	-228	Base	-348	Base	-373
Percent Net Plant Heat Rate Decrease, %	Base	2.57	Base	3.88	Base	3.96

*Natural gas fired in conventional cycle steam generator to consume an equivalent quantity to that fired in the gas turbine.
Bituminous coal fired for remaining conventional cycle requirements.

For economic evaluation purposes, three alternate fuel combinations were considered:

Alternate	A—Conventional		B—Combined Cycle
	Steam Generator	Steam Generator	Gas Turbine
I	Bituminous Coal	Bituminous Coal	Natural Gas
II	Bituminous Coal	Bituminous Coal	Natural Gas
III	and Natural gas*	Natural Gas	Natural Gas

*Conventional Cycle II-A uses the same amount of natural gas as IB, with the remaining fuel requirement supplied as coal. I-B and II-B are identical.

Alternate I compares a conventional coal burning cycle with a combined cycle burning coal in the steam generator and gas in the turbine.

Alternate II is similar to Alternate I except that the conventional cycle burns the same amount of gas as that required for the combination cycle,

the remaining requirements being supplied by coal. This results in a truer economic comparison between the combined and conventional cycles in areas where the price of gas is attractive but the gas is not available all the time. If gas is available at a favorable rate for the gas turbine, an equivalent quantity of gas should be available at the same rate for the conventional cycle.

Alternate III compares a conventional gas burning cycle with a combination cycle burning gas in both steam generator and gas turbine.

Heat Balance Diagrams

Fig. 1 is a heat balance diagram for the conventional cycle burning coal or oil. Fig. 2 is a heat balance diagram of the combined cycle firing bituminous coal in the steam generator and natural gas in the gas turbines. Fig. 3 is a heat

TABLE 2—ESTIMATE OF INSTALLED PLANT COSTS
GAS TURBINE-STEAM TURBINE COMBINATION CYCLE, EXHAUST HEAT RECOVERY TYPE

Type of Cycle	Conventional	Combined
Main Steam Pressure, psig	2400	2400
Main Steam Temperature, F	1050	1050
Reheat Steam Temperature, F	1050	1050
Steam Turbine Type	← Tandem Compound Triple Flow →	
Steam Turbine Exhaust Block Size, inches	25	25
Gas Turbine Type	—	One Shaft
Steam Turbine Generator Nameplate Rating @ Standard Rating Conditions of 3.5" Hga Exhaust and 3.0% Makeup, kw	250,000	275,000
Total Rating of Installed Gas Turbines @ Standard Rating Conditions of 80 F and 1000 ft Elevation, kw	—	38,000
Number of Gas Turbines Considered in Cycle for Capital Cost Estimating Purposes	—	4
Differential Installed Plant Costs		
Steam Generator and Appurtenances, Including Stack Gas Cooler	Base	\$ 3,040,000
Steam Turbine Generator, Including Foundation	Base	\$ 844,000
Gas Turbine Generators Including Foundation, Piping, Ducts Silencers, Control Boards, etc. (For Gas Firing Only)	Base	\$ 4,856,000
Condenser, Circulating Water Pumps and Auxiliaries	Base	\$ 314,000
Feedwater Heaters	Base	\$ -178,000
Building Foundations and Structures	Base	\$ 20,000
Accessory Electric Equipment Including Cables, Conduits, Ducts, Instrument and Auxiliary Transformers, Switchgear and Switchboards, Grounding System, Excitation Supply Equipment, etc.	Base	\$ 491,000
Miscellaneous Power Plant Equipment Including Compressed Air System, Cranes, Hoists, Communication Equipment, Lab Equipment, Alarms, etc.	Base	\$ 21,000
Subtotal	Base	\$ 9,408,000
Escalation @ 15%	Base	\$ 1,411,000
Engineering and Design	Base	\$ 150,000
Total Differential Installed Plant Costs	Base	\$10,969,000

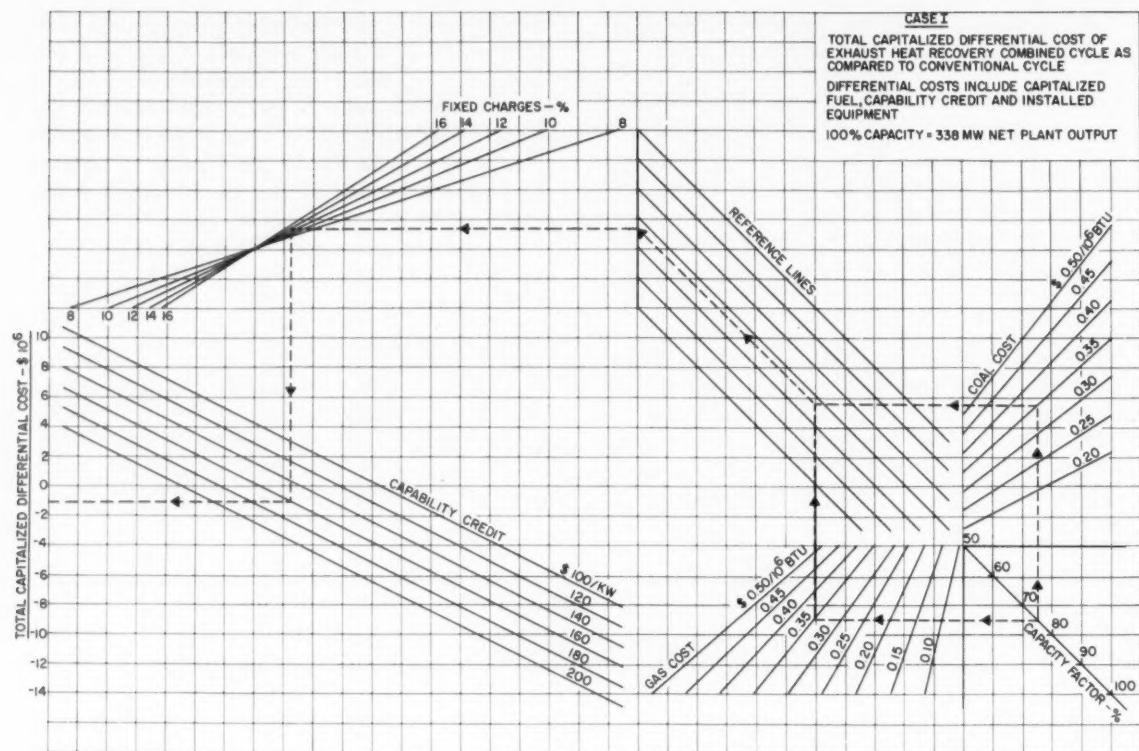


Fig. 4—Differential cost nomograph of exhaust heat recovery combined cycle vs. conventional cycle for Alternate I.

balance diagram of the combined cycle firing all natural gas.

Table 1 shows a summary of performance data for the combined cycle for each of the fuel combinations considered as compared to its respective conventional cycle. Performances for Alternates I and III were obtained directly from Figs. 2 and 3, and the performance for Alternate II was obtained by interpolation between Alternates I and III.

As shown in Table 1, the heat rate improvement range was between 2.57 and 3.96 percent, depending upon the fuels.

The total net plant output for the combined plant increased approximately 67 mw over the conventional cycle. This is due to both the gas turbine output and increased steam turbine output. The increased steam turbine output is due to the reduction in extraction steam from the turbine for regenerative feedwater heating in the high-pressure heaters. Considerable feedwater heating in the combined cycle is done in the stack gas cooler using high-temperature exhaust gases from the economizer.

The kw output of the gas turbines is less than rated value because of the high exhaust pressures required for the gas turbines when they take the

place of the forced draft blowers in the conventional cycle.

The pressurized cyclone type of steam generator was considered in this study, principally because it duplicates the existing plant. The gas turbine output and the relative thermal efficiency of the combined cycle is dependent to a certain extent upon the type of steam generator firing and the gas turbine exhaust pressures required. In an original design, with no attempt to duplicate an existing plant, it may be well to consider a pulverized coal fired unit with lower draft requirements.

Cost Estimates

The estimate of the installed plant costs is shown in Table 2. These costs are shown as differentials between the combined and conventional plants. As previously noted, two gas turbines were considered in the combined cycle for capital cost estimating purposes. The total differential plant costs for the combined cycle as compared to the conventional cycle was estimated to be \$10,969,000, including engineering and design costs and a 15 percent escalation allowance.

A final economic evaluation of the approximate size of this exhaust heat recovery combined cycle

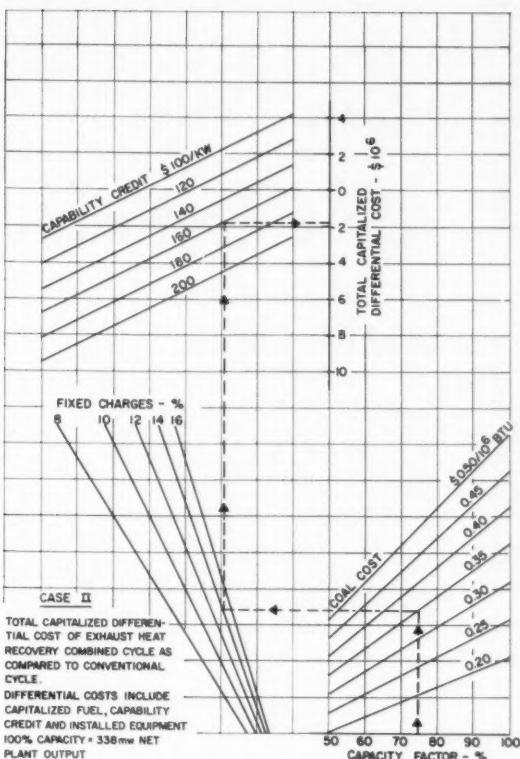


Fig. 5—Differential cost nomograph for Alternate II.

should include the expected plant capacity factor, fuel costs, fixed charges, and kw capability credit. For this purpose, Figs. 4, 5, and 6 have been prepared for Alternates I, II, and III respectively.

Figuring Differential in Costs

By using Figs. 4, 5, or 6 (and the fuel cost, fixed charges, and capability credit for any particular situation) the total capitalized differential costs between the approximate size combined cycle used in this study and its comparable conventional cycle may be determined. For example assume:

Capacity Factor	75%
Coal Cost	\$0.35/10 ⁶ Btu
Gas Cost	\$0.35/10 ⁶ Btu
Fixed Charges	14.0%
Capability Credit	\$160/kw

*100% capacity factor = 338-mw net plant output

Then, in Alternate I, with coal fired in the steam generator and gas in the gas turbine, this results in a total capitalized saving of \$1,100,000 using the combined cycle rather than the conventional cycle.

In Alternate II, with both cycles firing a combination of bituminous coal and natural gas, the combined cycle has a total capitalized differential cost of approximately \$1,750,000 less than the con-

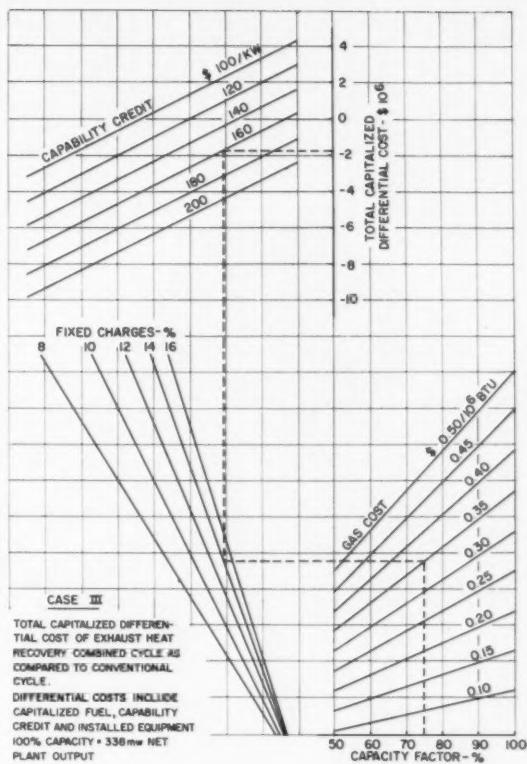


Fig. 6—Differential cost nomograph for Alternate III.

vventional cycle. Note that the cost of gas is not involved in this nomograph, since it is similar for both the combination and the conventional cycles.

In Alternate III, with both cycles firing natural gas, the combined cycle would save approximately \$1,800,000.

Examination of Figs. 4, 5, and 6 shows that the value assigned to net plant capability credit is an important factor in determining the economic attractiveness of the combined cycle. With the capacity factor, fuel costs, and fixed charges used in the previous illustrative examples, the break-even point of net plant kw capability credit would be approximately \$144/kw for Alternate I and \$134/kw for Alternates II and III.

Differential operating and labor costs have not been included, but the sum of the two is expected to be equal, on a unit kwh basis, for the conventional and combined cycles.

These tables and figures are not intended to be absolute or applicable to all plants, but they should prove useful in a preliminary appraisal of an exhaust heat recovery combined cycle of this approximate rating. The cycles and equipment considered should be re-evaluated by the consultant for each proposed application.



How We Air Condition Europe's Skyscrapers

ORESTE JELO
Marelli Aerotecnica

PIERO PALATRESI
Techint

Milan's new Torre Velasca

THE CONSIDERABLE INCREASE in population in the big industrial centers, together with the ever increasing use of automobiles after World War II, brought with it the introduction of skyscrapers to Europe. There still are not a great many tall office buildings, but they are no longer considered oddities. Madrid has just completed a new skyscraper, and London soon will have its first. Here in Milan we have two outstanding new structures, the Torre Velasca and the Perelli office building.

For us, the skyscraper brought many new problems which, admittedly, had long since been faced and solved by American engineers. And while we were impressed by American techniques, we wanted to maintain much that we felt was good in our experience with European design. It was a matter of economics, however, which finally led us to accept many American developments, modifying and altering them to meet the particular requirements of our own time tested methods of construction as well as the local job conditions.

It is important to recognize that European skyscrapers do not exceed 30 to 35 floors in height (350 feet). This permits our designers to use methods and materials that would not be justifiable with higher buildings. In fact, in Europe much use is made of supporting structures in reinforced concrete rather than steel. External walls are frequently of brick (not more than 8-in. thick) with plaster coats inside and outside for an over-all thickness of about 15 inches.

Our modern buildings usually are planned on a modular basis, requiring mechanical equipment with a high degree of flexibility to meet varying conditions. Since rental space in Europe generally is confined to the perimeter of the building (to a maximum depth of 20 to 25 feet from the external wall), air conditioning serves this area only.

Windows with metal frames now are being used widely, especially in office buildings. Panes of plain glass are preferred in regions where minimum winter temperatures are not below 15 F. The overall area of glassed wall surface sometimes may

reach 80 percent, but it normally is limited to less than 50. Where unusual exposure to solar heat is encountered, recourse is made to internal curtains or venetian blinds if external blinds are precluded by architectural or functional considerations.

In countries with very cold climates, it is customary to use thermal panels. With these, it can be assumed that outside walls will have a transmission coefficient of 3 to 6 Btu/hr-sq ft-°F.

European Air Conditioning Requirements

European air conditioning systems were, until recently, almost custom built for each job, but now good standard equipment is commercially available. The consulting engineer now can specify equipment instead of having to design it. To a great degree, this is based on American experience, with most important European manufacturers working under license from the leading American firms.

Air conditioning machinery and distribution systems are, to the casual observer, quite similar to those in a typical American installation. They differ, however, in several important respects:

¶ Standards for admitted noise level in America are considered too high for Europe. Our maximum admitted noise level for an air conditioning system usually is set at 3 decibels, with a background noise level of 35 decibels.

¶ Sensibility to air movement in occupied space limits velocity to no more than $\frac{1}{2}$ fps.

¶ With the high cost of electricity and steam in Europe, considerable attention is given to the operating cost of the equipment, with every effort made to reduce it to a minimum.

With these factors in mind, it is evident that preference is given to air and water distribution systems operating at relatively low velocities. This, of course, presumes higher installation costs. Usual velocity limits are 6 to 7 fps for water distribution, 1200 fpm for low velocity air distribution, and 3600 fpm for high velocity air distribution.

The system usually preferred for skyscraper air conditioning is the semicentral, with main units placed in the basement of the building and distribution units and registers in the individual rooms. The advantage of this system is the low operation and maintenance labor cost, with all servicing concentrated in a single area. In addition, each occupant can control heating or cooling to his own requirements merely by adjusting his own register.

Central systems usually are designed for automatic pneumatic or electric control, while individual units are hand regulated. For very large, high buildings, preference is given to the induction unit system because of its lower first cost.

In many locations, a considerable quantity of well water may be available at temperatures low enough

to permit its use in the conditioning system. When subsoil conditions are favorable, this solution is used to lower operating costs. Use of well water is recommended only when its temperature is below 62 F. The entire cooling load usually is distributed two thirds to the water and one third to a refrigeration system. Not only does the use of well water cut operating costs, it also reduces the capital investment for the refrigeration system.

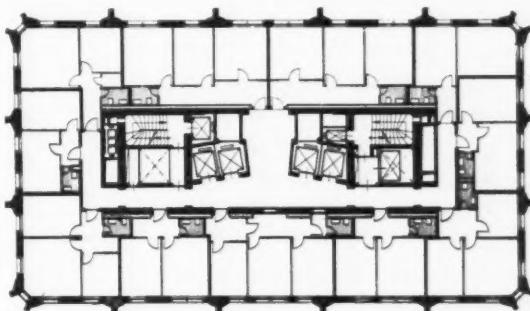
Milan's Torre Velasca

The Torre Velasca is a good example of an air conditioned European skyscraper. This building has 28 stories, two of which are below ground level. The second floor is projected on the northwest side, to provide a covered main entrance and two glass-walled stories. The first basement was extended under this projection and is divided into rentable space attached to the first floor stores. The second basement was designed to be entirely occupied by building service equipment.

Rentable areas from the 2nd to the 26th floor were designed for business offices (2nd to 10th floors), professional offices (11th to 17th floors), and residential apartments (18th to 26th floors). This distribution was the result of studies made to determine the peak investment return.

Before deciding on the type of structure, consulting engineers from New York City made a survey to determine the total tonnage of steel required for the structure, as well as the total cost of erection. Based on the then current prices, it was evident that a reinforced concrete structure could be built at a cost about 25 percent below that for steel. The building was built, therefore, of reinforced concrete supported by a cross-beam structure distributing the concentrated loads of pillars on a base slab.

The vertical structure consists of 16 pillars around the perimeter and a central area for stairs and elevators. The pillars do not project into the rooms. The cross section of the building is constant up to



Typical plan of office floors in Torre Velasca.
Central core is not serviced by air conditioning.

the 18th floor, where it enlarges, providing for the top seven floors an overhang of about 10 feet.

There is an interesting reason for this unusual overhang design. The building code in Milan prohibits the erection of a new building close against existing structures, but the wording of the code is such that it in no way forbids spreading out the new structure after it rises above those around it. Taking advantage of this, the architects were able to get considerably more floor space than appeared possible, and yet at no point is the new structure closer to the surrounding buildings than the law allows. The Torre Velasca is probably the world's only example of good architectural design inspired by a loophole in a building code.

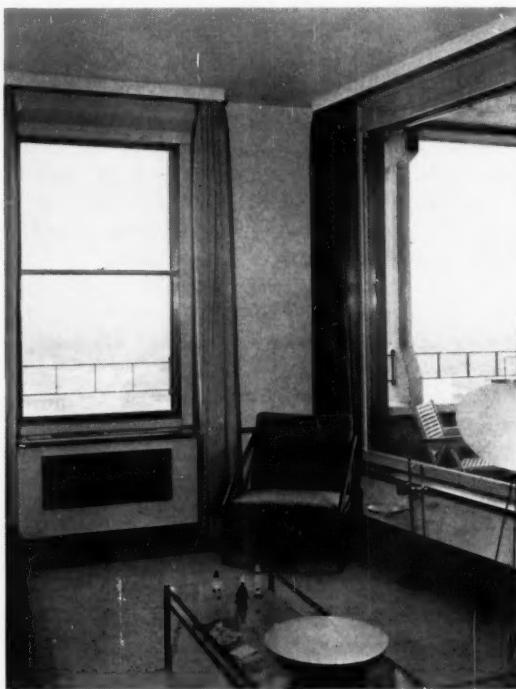
Outside walls are concrete slabs faced with mosaic tile and backed with expanded polystyrene panels of high insulating value. Window frames are double hung in anodized aluminum. Protection against the sun is obtained with external roller blinds with adjustable aluminum blades that can be operated from the inside. The blinds can darken the rooms even on bright days. Main entrances on the first floor are protected by glass doors supplemented by air curtains that reduce drafts when doors are opened.

The structural design provides thermal conditions ideal for the operation of an air conditioning system. In fact, outside walls have a thermal transmission coefficient of only about 3 Btu/hr-sq ft-°F, and glass covers only about 40 percent of the total wall area.

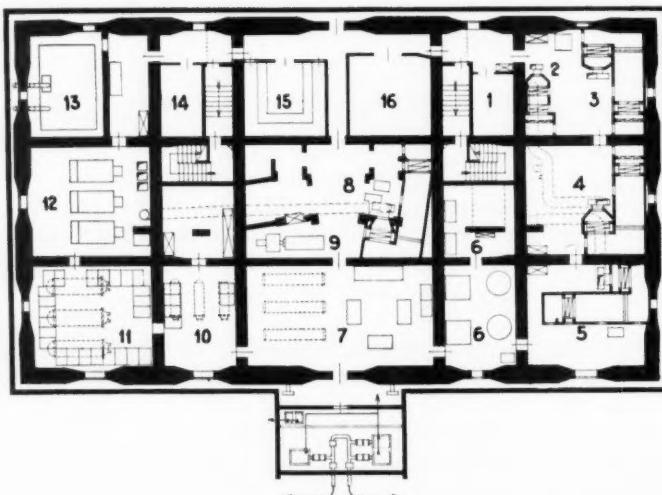
Planning of the central units in the lower basement required special study, as all apparatus was installed in enclosures located in the free spaces of the foundation. The walls of these enclosures are

actually members of the cross-beam structure supporting the building. It was therefore necessary to take into account, in an early stage, the location of air and water ducts passing through these walls.

The whole air conditioning system is a combination of five separate systems, each serving its own section of the building according to occupancy

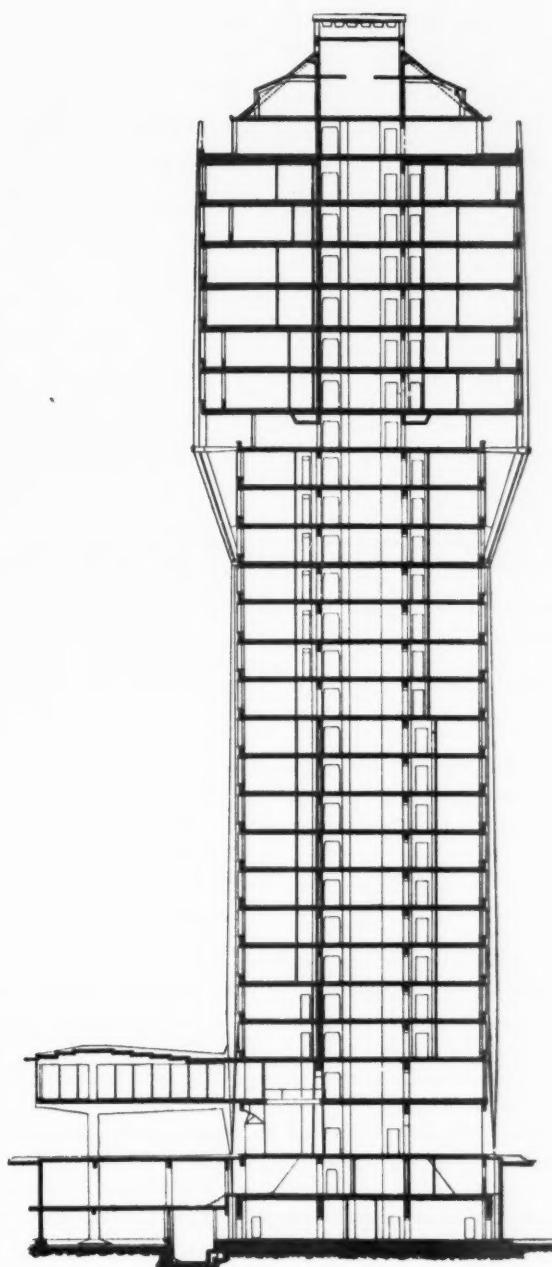


Typical room conditioning unit uses well water in heat exchanger. Water temperature is about 60 F.



Second basement is entirely occupied by building service facilities. 1. Storage batteries. 2. Air conditioning unit for upper basement. 3. Air conditioning unit for first and second floors. 4. Air conditioning for offices in lower floors. 5. Air conditioning unit for offices in upper floors. 6. Water plant. 7. Refrigeration plant. 8. Air conditioning unit for dwellings. 9. Diesel power generator set. 10. Pumps. 11. Main pumping units. 12. Heating plant. 13. Fuel tank. 14. Operator room. 15. Control room. 16. Transformer room.

requirements. All these are induction types, using primary air taken from outdoors. Primary air passes through each central unit for filtration, cleaning, refrigeration, and (in summer) dehumidification. It then is conveyed at high speed through ducts of small diameter to the individual room apparatus placed beneath the windows. Exhaust air is drawn



Vertical cross section of Torre Velasca shows 10-ft overhang of eighteenth floor and basement extension.

in through suction equipment installed in the service rooms. Each system is provided with central control and zoned according to exposure of the rooms or areas they serve.

Refrigeration of the primary air is obtained from well water, available in the area in large quantities at a temperature of about 60 F. Water from these same wells also is used in the heat exchangers of the individual room conditioning units. Water discharged from the systems is further used for cooling the refrigeration plant condensers.

Temperature of the waste water is about 25 F higher than intake temperature, indicating the large savings achieved. In fact, the refrigeration unit actually provides only for final dehumidification of the primary air, to insure adequate moisture removal not possible with the utilization of the well water cooling alone.

Statistical Data

Some statistical figures on the Torre Velasca air conditioning system give an idea of our European approach to this type of project:

- ¶ Summer room temperature 78 F with 50 percent relative humidity (90 F outside with 55 percent relative humidity)
- ¶ Winter room temperature 70 F with 50 percent relative humidity (22 F outside with 80 percent relative humidity)
- ¶ Three boilers supply a total of about 10 million Btu/hr
- ¶ Total quantity of conditioned outdoor air is about 60,000 cfm
- ¶ Three refrigeration compressors have a total capacity of 100 tons
- ¶ Well water provides additional refrigeration capacity of 300 tons
- ¶ Total horsepower of motors operating air conditioning system is 280
- ¶ Pumping rate from well is 700 gpm
- ¶ Air conditioning system installed cost is \$2.00 per square foot of building area or \$1000.00 per ton of refrigeration

The over-all cost of the Torre Velasca was \$3 million, exclusive of the land, design and supervision, and interest on investment. This gives a figure of \$18.00 per square foot of rentable area. Total rentable space is 175,000 square feet. The over-all cost can be broken down as follows:

Materials & labor for basic structure and	41.2%
labor for installation of equipment
Finishing work, interior and exterior 34.6%
Mechanical and electrical equipment 23.7%
Landscaping 0.5%

These figures are of considerable interest when compared to the costs of American buildings of similar construction and occupancy. ▲▲



Europe – 1959 – Engines, Engineers,

HUNTER R. HUGHES, Editor

MOTORING from London to Birmingham on Whitsun weekend in a new Aston Martin is a nerve shattering experience for an average American driver. The Aston Martin is no Detroit drive-it-yourself. Whitsun traffic on English roads makes our Labor Day traffic look light, and it seems that most of the cars and even the motorcycles on English highways proudly display a large "L" over the license plate, indicating that the driver is a Learner. Staying on the left is a minor problem.

Hugh Duffill, the Boston consulting engineer, and I picked up the Aston Martin at the factory just outside London. Duffill had ordered a red convertible (a drop-head coupé) several months before when we had decided to go to the annual meeting of the International Federation of Consulting Engineers, held this year in The Hague, and Mr. Herting, of Aston Martin Lagonda Limited, had assured him of delivery upon our arrival in London. The company makes 400 or so cars a year, and

C_E exclusive
many of these are the single passenger racing models designed for use only on the Grand Prix tracks, so it is not easy to get exactly the model one wants at the time one wants it. There is however, a considerable advantage in purchasing and picking up a car of this type on a trip abroad, for the Aston Martin sells for over \$10,000 here against \$7000 in England. And if a car is driven for a few miles in Europe, it enters the United States as a used car at a substantially reduced duty.

Before taking delivery, we had a talk with Mr. Herting to find out what special knowledge was needed to handle this thinly disguised racing car. "What rpm," we asked, "is proper for shifting up or down from one gear to the next?"

"Really makes no difference," Herting replied. "Sterling Moss often shifts down from fourth to second at quite high speeds."

We were not reassured by the example of Mr. Moss. He is, we are willing to admit, the better driver. Duffill seemed to recall reading about a



and Enterprise

trick Moss had of shifting down from fourth to second on a curve and locking the rear wheels for just an instant in the process, thereby peeling around a little sharper than the other drivers. We left the factory with the distinct feeling that our first stop would be for the purchase of a large "L" to go over the license plate.

We had no opportunity to practice the Sterling Moss shift between London and Birmingham (about 90 miles), for we never got above second gear. Mr. Herting had suggested that we hold to below 3000 rpm for the first 500 miles, and at that engine speed the car did a comfortable 45 mph in second — perhaps a trifle fast for the driving conditions in Whitsun traffic.

Quick Disaster

With some pride of accomplishment and considerable nervous relief, we left the car in the garage of Birmingham's Grand Hotel, checked in, and headed for the dining room. Just a few minutes later

the porter came to the table to inform us, "I am afraid, sir, there has been a slight accident."

At the garage entrance, a gas pump, listing strongly to the starboard, provided a full explanation. The attendant, who looked as though he had scarcely had time to telephone about his unemployment insurance, pointed shakily, "Look what it did to the petrol pump!"

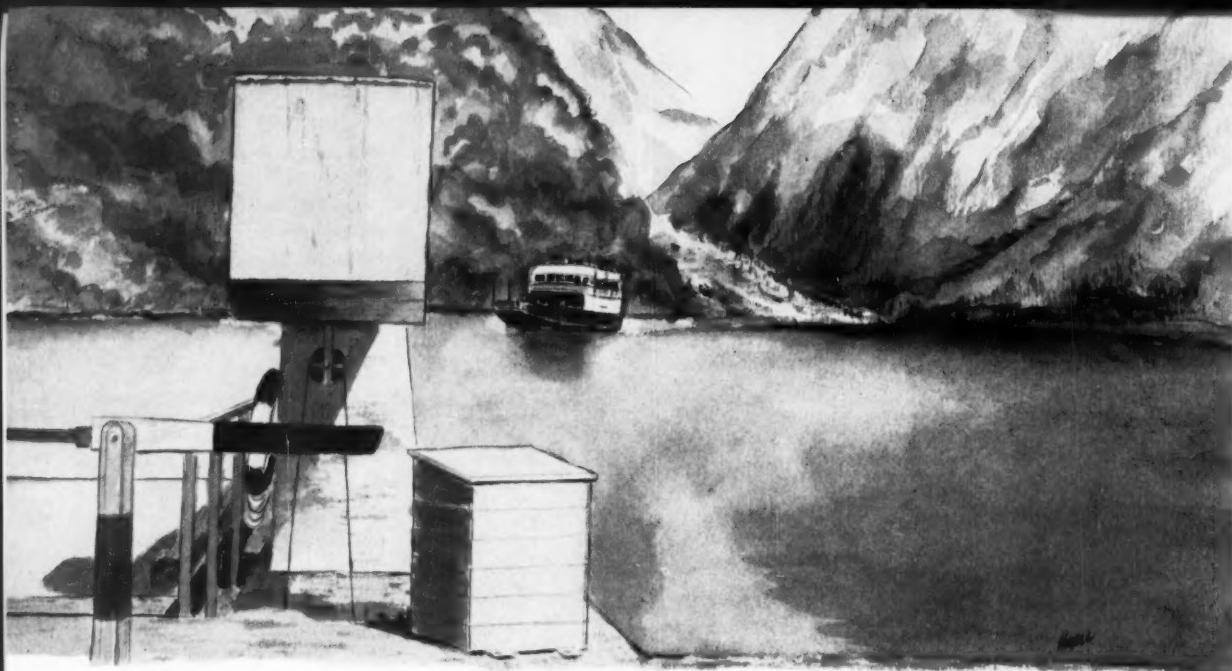
We felt justified in showing more interest in what the petrol pump had done to the car.

It was not a pretty sight. The collision had been head-on, and the profile of the pump was clearly impressed upon the bumper, the cowling, and the grille. A careful inspection showed "OSSEI" transferred in paint from pump to grille. It turned out that the attendant, no Sterling Moss himself, had hit the accelerator instead of the brake, an almost forgivable mistake, since the accelerator and brake pedals are about equal size, at the same height from the floor, and just a fraction of an inch apart.

Because of the holidays, no repair shops were open, and we had to continue our trip from Birmingham on to Newcastle with the damaged front end. Few persons are so sensitive that they object to driving a dented Dodge or a bumped Buick, but an Aston Martin is different. At each stop a small crowd collected. The observers would admire the car with an expression on their faces that showed a strong pride in British craftsmanship; they would examine the dented front end and click their tongues; they then would give us a look that seemed to say we were the worst kind of Americans — careless, callous, and therefore contemptible.

The next day, in Sunderland, we found a good man with hammer and press who returned the





cross-eyed car to proper point, but even after that, when an admirer would run his hand over the front of the bonnet, we would wonder if he could feel the slight imperfection in the paint. It was like wearing a Patek Philippe with a cracked crystal.

To and Through Norway

Duffill decided that the most interesting way to get to The Hague in time for the FIDIC meeting would be to take passage on a ship from Newcastle to Bergen, Norway, drive from there to Oslo, and then continue down through Sweden, Denmark, and Germany into Holland. It is a 24-hour trip of nearly 600 miles across the North Sea to Norway, but the fare was remarkably low, about \$14 per person and \$20 for the car. This was no oversized ferry, but an ocean-going ship with staterooms, a large lounge, and a good dining room. Cars were stowed below deck. We had been on board only a few minutes and were still an hour or so from departure when the intercom blared, "Mr. Duffill, Mr. Duffill, see the purser's office about your car." We were certain that the sling had snapped and the car lay broken in the hole or hung over the edge of the hatch, folded like a crushed beer can.

It was not that bad. The purser wanted to get a signature on an insurance paper. The car, we observed, was in place below deck, stoutly lashed.

Norwegian law states that automobiles must stay on the right side of the road. A few miles away from Bergen or Oslo, this regulation becomes theory rather than fact. There is no right or left side of

the road, there is only the middle—and not too much of that. The Norwegians have spent as much or more per mile on highways as other countries, but they face enormous natural handicaps to highway construction. The Alps may be higher than these mountains but it takes more miles of highway to get from one town to another in Norway than in Switzerland.

Terrain a Handicap to Highways

A glance at a relief map of Europe explains Norway's highway problem. Bergen, on the west coast, is set against a backdrop of tall and rugged mountains. The highways from Bergen run over, through, and around a series of peaks and ridges that finally diminish into foothills a few miles from Oslo on the eastern border. Mountains are not the only problem for the highway engineers of Norway. A road will wind down from a high ridge and come to an abrupt end at a fjord that has found its way through the valleys from the sea. This does not mean a short span of water that could be bridged. It means a ferry trip of two to four hours before reaching a landing from which the road can again lead off into more mountains.

It is almost accurate to say that every mile of Norway's roads are currently under construction. The highway department has decided that it would be a near impossible task to attempt to change the thousands of miles of gravel mountain road into broad highways in a few short summer seasons, so they have set up a separate project at nearly every curve—which means about every 500 yards.



The idea is to ignore the short straight stretches in between while the curves are widened to 25 to 40 feet and paved. Apparently the highway department is attacking these curves in order of current conditions, which means that the motorist comes upon a construction crew blasting, picking, or paving some curve along almost every mile of the 300 miles from Bergen to Oslo.

This plan is undoubtedly a wise one for Norway. No matter how much money is spent (short of digging a 150-mile tunnel) the route from Bergen to Oslo will never be a high speed roadway. Even if it were physically practical to build a super highway through these mountains and over these fjords, it would not, even then, be safe to drive at more than 35 or 40 mph. The driver always would be in a tunnel or rounding a sharp curve. Perhaps the highway problem was best illustrated by the engineer in Oslo who said, "If we could find something that could be made out of rock and water, Norway would be the richest country in the world."

These Norwegian roads must be frustrating to the Norwegian driver anxious to get from farm to town and back, but they are not without their pleasant aspects for the tourist. When forced to drive at an average of about 20 mph, the countryside and even the people become an intimate part of the trip. It reminds one of touring the United States before the 1st War. Every person on the road waves and speaks. Motorists moving in the opposite direction stop and back up to a broader spot on the road to let you pass. When you come upon a bus or truck, the driver immediately pulls

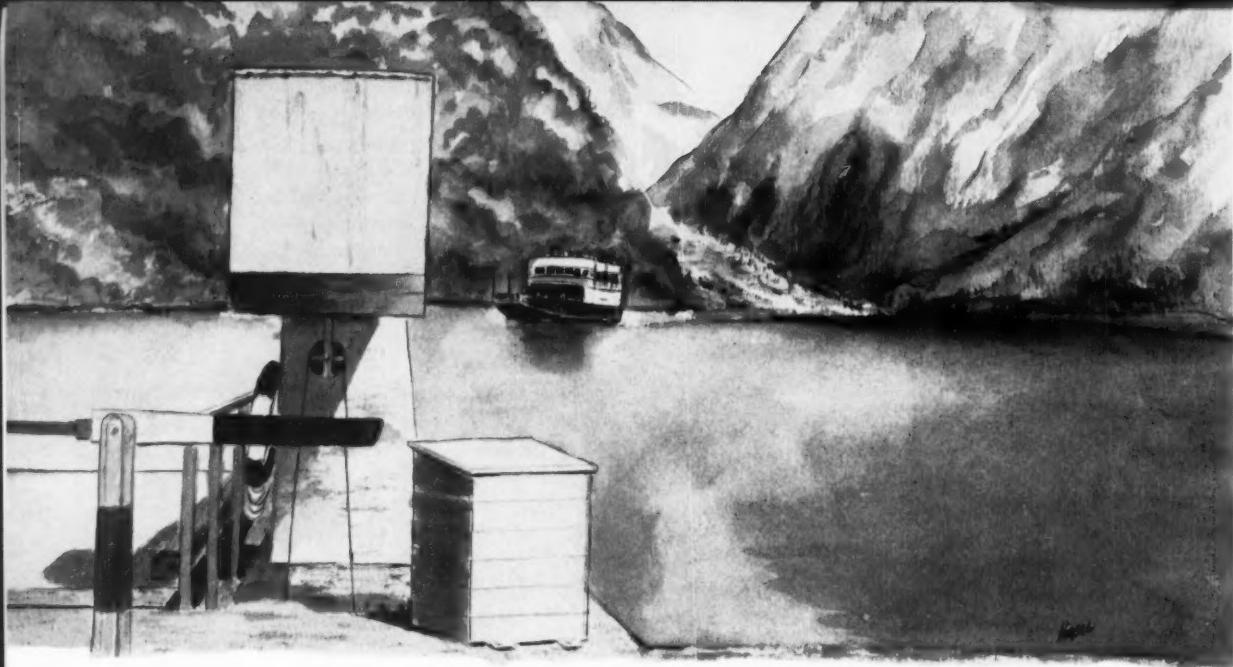
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Oslo's Engineers

Oslo is a modern, cosmopolitan city, if one can use the students and the consulting engineers as a sample of the population. The University is located in the center of the city, and the downtown population is dominated by the students. All of them speak English, and many of the young men have traveled about the world in Norwegian ships.

Oslo has a great many firms of consulting engineers for a city of its size. Forty-five firms are members of *Tekniske Konsulenters Forening* (The Society of Consulting Engineers). Members must be graduates of a recognized technical university and must be independent of any commercial connections. Per A. Madshus, the secretary, pointed out that TKF had been founded in 1919 and now included among its members most of the consulting engineers in Norway. Most independent consultants who are not members fail to qualify because their degrees (if any) are not from a recognized technical university.

Duffill and I spent a Sunday afternoon and evening discussing with Per Madshus and Kristian Prestrud, the president of TKF, the problems of private practice in Oslo. We might have been talking to consultants in Spokane or St. Louis except for a few differences in technical and legal terms. For example, their association has been dealing with the telephone company concerning the listing of unqualified persons under "Ingeniorers, Kon-



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Prestrud, Macshus and Hylland say Oslo's American Embassy is an architect's bad joke.

sulenters" in the yellow pages. They felt they were making considerable progress on this. Meanwhile, they were buying space to list members of the TKF as a group. They wondered if we had any troubles along these lines in the United States!

Visit New Buildings

The next morning was spent with Mr. E. N. Hylland, a past president of the society, who, with Mr. Prestrud, was planning to attend the FIDIC meeting in The Hague, and we had a look at two interesting new buildings. One was the American Embassy, currently under construction. It is a four-story, flat-iron structure of dark grey, almost black, concrete pierced with long narrow windows. The Norwegian engineers thought it was a rather bad joke architecturally, but it may look better in

winter, when all the lights go on in the early northern afternoons and snow provides a white background for the black facade.

The other building, a government office, was built of prepacked concrete. The forms were first packed with carefully graded aggregate, then the grout was pumped in under pressure. A series of interesting geometrical designs were formed by attaching small strips of wood to forms. When the forms were stripped, this left the patterns in the concrete. The impressions then were filled with a dark mortar to contrast the design against its white concrete background.

Joint Venture Firm for Foreign Work

Before starting for The Hague, we had our lunch with three members of Norway's most interesting



firm of consulting engineers. Ten independent consultants in Oslo have formed a group venture to offer services abroad in connection with large engineering projects. The individual firms tend their own separate knitting in Norway, but on overseas projects they get together under the name "Norconsultants." Head of the group venture is Knud-Endre Knudsen, and he is assisted by Bjorn Slugaard. These two men run Norconsultants and are skilled businessmen rather than engineers. The ten associated consulting firms are responsible for the technical aspects of the projects while Knudsen and Slugaard concentrate on handling the client relations and finance.

In other European countries there are somewhat similar teams of consulting engineers brought together for the same purpose, but Norconsultants differs from most of the others in that it is in no way sponsored or financed by the government nor does it have any connection with any contracting or manufacturing firms. Knudsen, who had just returned from a project in Ethiopia, says business is good and getting better.

During lunch, Asbjorn Aass, whose firm is one of the ten in Norconsultants, pointed out that he had worked as a designer in a Boston engineering firm for several years before he went into practice for himself in Oslo. Much to Duffill's surprise, it turned out that both he and Aass had been with Stone & Webster as structural engineers, yet this meeting in Oslo was their first.

Traveling South

It took two days to get to The Hague. The route ran from Oslo south to the Swedish border, where we again switched to the left side of the road. In Sweden the topography quiets down and good highways run through the rolling foothills. The



Oslo's new office building of precasted concrete.

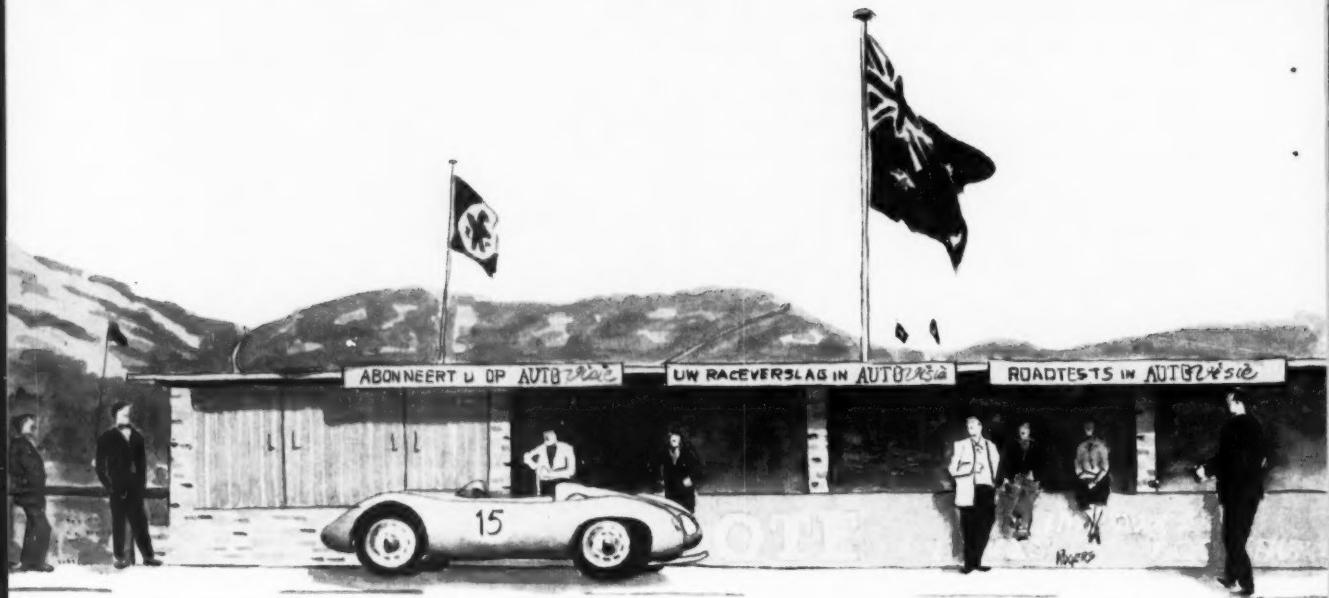
water and stone of Norway give way to pasture and forest.

In Denmark the traffic moved back to the right, but the highways remained broad and smooth. The big difference was the frequent change from road to ferry and back to road again.

In Germany, all highways are not autobahns. The average highway is carefully laid out and well maintained, but some high political official of the '30s must have had the Belgian block concession. Mile after mile of main highway is paved with this cut stone — even the new stretches. This undoubtedly makes an excellent roadbed, but the surface is anything but smooth.

The same type of paving continues into Holland, but here the hazard is increased by the attractive but dangerous practice of hedging the edge





of the roads with trees. Where there are no trees, concrete posts are substituted. These obstacles clearly proclaim the edge of the paving, but they make it impossible to pull off in emergencies, which are not rare. The average European driver is a man of great faith. If he cannot see beyond a curve, he assumes the road is clear for passing.

FIDIC Meeting

The annual General Assembly meeting of the International Federation of Consulting Engineers (FIDIC) was headquartered in the Palace Hotel, at Scheveningen, a coastal resort area in the suburbs of The Hague. As at any convention, it was no trouble to find friends in the lobby — Julian Tritton, of London, president of FIDIC; Gail Hathaway, from the World Bank in Washington; Prestrud and Hylland, just in from Oslo by plane. In the dining room, Dr. Walter, of Essen, and his son Hans, who manages the firm's office in Kohn, were seated with Rusting, the Dutch secretary of FIDIC; Armand Tourne, president of the Belgian Association; and his association secretary, R. Fostroy.

Back in the lobby, we were fortunate to find Herr Rosenthal, president of the Berlin section of the German association (VBI), and the brilliant young engineer, Eckehard Rastedter, who had driven in through the corridor from Berlin to attend the meeting.

This was the first truly international meeting ever held by consulting engineers. There were delegates from each of the ten European nations in the Federation, plus two observers from Ireland. South-

Africa sent their association's past president, M. S. Sviridov; Lorne Wiggs represented Canada; Ed Wolff, of Chicago, was the official delegate from Consulting Engineers Council. The only member association without a representative was Australia.

Perhaps the most remarkable aspect of the General Assembly was the fact that most of the delegates and observers had known each other for years. Without doubt, a higher percentage of these men were personally acquainted than would be true at, for example, a meeting of the Cleveland Engineering Society. There was scarcely an engineer at the meeting that both Duffill and I had not met before, either in Europe or America, and this was typical of everyone present. Little time had to be wasted on introductions.

Person to Person

The official business session of FIDIC was completed in one day, but the next three days were filled with luncheons, dinners, receptions, and inspection trips. In a sense these gatherings were more important than the business session, for it was in talking person to person or in small groups that the common problems of private practice were thrashed out and plans were made for future FIDIC activities.

The Dutch were generous in their hospitality. The editor of *De Raadgevend Ingenieur* (The Consulting Engineer), H. H. W. Van Eyk, even arranged a private dinner for editors of consulting engineer publications and their friends. The friends made up the majority at the dinner, for Van Eyk, the

host; Pinkerton, of *The Consulting Engineer* (London); and I were the only editors at the meeting.

Next year, the FIDIC General Assembly will be in Stockholm, and it is quite likely that in '61, New York could be the site. If so, members of the Consulting Engineers Council will have an opportunity to watch personally the proceedings of this international body to which they belong.

Grand Prix at Zandvoort

On the Sunday following the General Assembly, Duffill and I turned our attention back to automobiles. The Grand Prix races were being held at Zandvoort, just north of The Hague. We were unhappy to find that Sterling Moss was driving a Ferrari rather than an Aston Martin, but we did have a chance to observe him in action. As always, Moss was the crowd's favorite, but he did not finish — some kind of gear box trouble with the Ferrari. Duffill and I felt sure that he would have won if he had been driving an Aston Martin, but our prejudiced opinion was weakened by the fact that neither of the Aston Martins finished either. The race was won by a BRM, a car that had never before placed in a Grand Prix contest. Aston Martin's victory had to wait two weeks for the Le Mans race where it finished first and second. It was interesting to read in the *New York Times* that this double victory "would mean thousands

of sales for Aston Martin." This prediction may be an exaggeration in view of the firm's 400 car per year production schedule, but in a recent letter, Mr. Herting did indicate his considerable pleasure in the Le Man's results and said he thought he would have no trouble getting rid of the grey Gran Turismo model he now has for sale. He can give March delivery on a DB-4, if ordered now.

After the Zandvoort races we followed Hans Walter and his father to Essen for a look at their firm's new offices. Then on to Kolin to see Han's photoelastic stress laboratory where he analyzes structural designs with polarized light (see "We Study Stresses With Polarized Light," May 1959).

There was much more we had planned, but our time had run out, and we had to postpone promised visits with Dr. Ing. Peters, of Hamburg, and others we had hoped to see. Most of those we missed are being visited this month by Eastern Editor Marjorie Oden, who is making an editorial trip through England, Holland, Germany, Switzerland, France, Italy, and Spain. It will be her duty to consolidate our successes, beg forgiveness for our faux pas, and extend our contacts.

England and Home

Back in England, again, we took the car to the factory in Feltham for a check-up and for shipment to Boston; we lunched with five prominent London consultants at St. Ermin's Club as the guest of J. M. Linton Bogle, senior partner of Lemon & Blizard; we had cocktails with Colonel Walker, secretary of the British Association of Consulting Engineers at his club (Travelers); and we talked with Julian Tritton to get his opinion of the FIDIC meeting. (He thought it was the best in FIDIC's history.)

The return trip to Boston was by turbo-jet Britannia — not nearly so fast as Pan American's 707 jet that took us over, but quiet and comfortable. On the 10-hour flight back we could count as accomplishments not only the time spent with old friends and new acquaintances but the eight manuscripts promised by prominent European consulting engineers for publication in *CONSULTING ENGINEER*.

It was gratifying to find that in Europe the engineers in private practice feel that *CONSULTING ENGINEER* is their magazine as much as it is the magazine for American consultants. As R. Fostroy put it in a letter we just received—

"Je tiens à vous remercier de m'envoyer votre revue 'CONSULTING ENGINEER' que je considère comme un trait-d'union entre les ingénieurs-conseils de tous les pays du monde. Comme vous pouvez le constater, les ingénieurs-conseils du monde entier concentrent leurs efforts pour défendre leurs intérêts et les intérêts de leurs clients. Je crois que votre revue peut les aider à atteindre ce but." ▲▲



New American Embassy - The Hague



Who Does What?

MILTON TUCKER

WHEN PREPARING the contract documents for a project involving several prime contracts (e.g., heavy foundations, general construction, plumbing, heating, electrical . . .), the engineer must use extraordinary care in scoping each of the separate contracts. The work must be divided meticulously in such a manner that there are no voids or overlapping between contracts.

Careless scoping of work is the chief cause of the endless disputes over who does what. Disagreements usually revolve around the performance of items that are inherently controversial — items that by their very nature are always on the border line between two or more trades. These debatable items sometimes are done by one type of contractor, sometimes by another, depending on the size and type of project, local labor union jurisdiction, and other variable factors. Consequently if these items are not spelled out in the scope of work they naturally are open to dispute.

The resulting arguments, lawsuits, and ensuing extras are an annoyance to the owner and a discredit to the engineer. Unfortunately there are no standard practices on which the engineer can rely in settling the issues one way or another. If the controversial item is not in the scope of work, no contractor can be required to provide it, and it lands on the owner's doorstep as an extra.

Notes on the drawings are not contractually adequate, unless they state explicitly who does what.

On multicontract projects it is mandatory that the work be fully and explicitly scoped in the specifications, because all the drawings (structural, architectural, plumbing, outside utilities . . .) often constitute the contract drawings for each and every contract. For example, the architectural drawings may, with all propriety, indicate conditions and materials which are normally part of the plumbing contract. Furthermore, these plumbing materials may not be noted on the plumbing drawings. If the work is not itemized clearly in the plumbing specifications scope of work, it cannot be assumed, or proven, that the work is legally a part of the plumbing contract. While it is true that a note on one of the drawings may clarify the scope of work, good engineering demands that all of the work for a particular contract be scoped in one spot, and not scattered over acres of blueprints.

Typical Debatable Items

Good examples of items sometimes included in one contract, sometimes in another, are the footing drains around the walls of buildings and the subsoil drains under basement floors. Engineers' opinions on the allocation of this work are sharply divided. Some claim that these drawings belong in the outside utility contract. Other engineers insist

they should be installed by the plumbing contractor. Still others invariably include the drains in the general construction contract. Moreover, an engineer may, with justification, reverse his decisions from project to project, depending on the size, type, and location.

On projects where the engineering itself is divided up and awarded to several independent engineering offices (as is often done on public work), the scoping of these drains may become a hassle between engineers as well as contractors. It is conceivable that the mechanical engineer might assume that the civil engineer is including these drainage items in the general construction contract. Meanwhile the civil engineer may take it for granted that the mechanical engineer is specifying this work. Then unless the project is coordinated thoroughly, neither engineer incorporates the work into his contract documents. Subsequently no contractor includes the work in his bid and every contractor refuses to perform it. Result? The owner gets the bill for the extra, the engineers get red faces and ulcers.

Another example of a disputable item is the lead pans, or safes, under individual shower stalls. Sometimes these lead pans are taken by the general construction contractor, though usually the plumbing contractor does this work. But if the pans are not scoped somewhere, nobody takes them and the owner finds another orphan on his doorstep. The same applies to factory precast terrazzo receptors under shower stalls and in janitor's closets. Are they plumbing fixtures or are they construction items? Opinions vary, and the specifications had better be perspicuous!

Sleeves, so important where piping passes through membrane waterproofing, are another disputed item. Shall the concrete man provide and install these sleeves? After all, he is sometimes the sole contractor on the job in the early stages of the project. Or shall the piping contractor provide and deliver them to the concrete contractor "in sufficient time to permit installation without delaying the work?" Or shall the waterproofing contractor provide suitable sleeves and flash them into the plies of his waterproofing? Moreover, after the pipes are in place who caulks between the pipes and the sleeves? Does the waterproofing contractor have the undivided responsibility for the water tightness of the entire installation or does the plumber caulk between his own pipes and the sleeves? Here again there is a wide divergence of views as to who does what — and the basis for some red hot arguments when water starts to seep in around the pipes.

Then there is the old question that must be answered on nearly every job of any importance,

Who provides roof drains? Who sets them in place, who connects them to the rain conductors, and who flashes them?

When pipelines are laid in unstable soil, or in fill, it generally is recognized as good engineering to support the pipes on masonry piers. It could be argued that it is the piping contractor's responsibility to provide adequate supports for all his work. However, if the masonry piers are not scoped in the respective piping specifications, the piping contractor could claim that the piers are "just so much more masonry" and therefore the work of the general construction contractor.

There are hundreds of these disputable items, and it is very easy to overlook one or more in the rush to meet deadlines. All experienced engineers recognize this, yet the engineering profession and the construction industry are plagued constantly by controversies over the division of work and the limits of contracts.

What To Do

Engineers could save themselves a lot of headaches by using coordinating check lists as an aid to scoping the work into the proper contracts. Such check lists set forth all the items about which there could possibly be any doubt as to who does what. They are not the familiar check lists that have been used for years as an aid in writing specifications. They list only those interrelated and controversial items that could be provided by one of several contractors, but often end up being provided by none.

The content of coordinating check lists will vary from office to office, depending on a number of variable factors, such as: types of work customarily performed by the engineer; policies of the office in awarding certain parts of the work to certain types of contractors; and local labor union practices and jurisdiction.

These coordinating check lists do not contain the answers to any questions. They simply list the items of work that must be discussed and eventually included in one or another of the contracts. The lists are valuable as agenda for conferences between the various engineers associated on the project. They also help in preparing job directives and writing up the minutes of conferences.

Coordinating check lists are especially important on projects where the various phases of engineering have been awarded to separate engineering offices. On such projects, where the engineering is necessarily a divided responsibility, the project engineer (whether he be civil, mechanical, chemical, or other) must coordinate all phases of the engineering, particularly the scope of work of the several construction contracts. He must

make certain there is a complete meeting of minds. At conferences, many of the customary questions will be raised, but without a check list some important items may be overlooked.

Typical Coordinating Check Lists

The lists appended below are complete, as used by one firm for four specific prime contracts. They

have been, and still are, subject to amendment for both specific situations and general use. To facilitate additions, modifications, and pertinent comments, they are reproduced on a standard form with ample spacing between lines, so it is easy to clarify, in writing, any areas open to dispute.

Typical of the problems encountered on large projects is the opening or altering of construction

Contents Of Coordinating Check Lists For Assigning Certain

GENERAL CONSTRUCTION CONTRACT

1. French drains – not including the floor drains or the drainage lines
2. Subsurface drainage fields for lawn areas, playing areas, athletic fields, and similar areas
3. Subsoil drains under the basement floors, and footing drains (and porous fill therefor) to and including dry well, or to sewer line at a point 5 feet outside building, or to limit of contract shown on drawings
4. Forming holes, chases, recesses, and openings in building construction (with necessary lintels) for installation of piping and equipment of all contractors in accordance with information supplied by the respective contractors *prior* to the commencement of the construction work in which the holes, etc. are required
5. Membrane waterproofing of group shower rooms and metal flashing (other than lead) of floor drains therein
6. Flashing of roof drains (other than lead)
7. Base flashing of ductwork passing through roofing, and of equipment of other contractors supported on roofing
8. Base flashing of curbs for roof ventilators and for other equipment furnished by other contractors
9. Gravity roof ventilators and power roof ventilators not connected to ductwork
10. Ornamental grilles and registers
11. Stamped grilles and registers not connected to ductwork
12. Louvers built into wall construction, including fixed, gravity, and manually operated types. (Mechanically operated types or interior louvers attached to ductwork to be furnished by heating and ventilating contractor)
13. Access panels indicated on architectural, mechanical, and electrical drawings
14. Accessories in toilet and bathrooms
15. Marble and plastic sink and lavatory tops
16. Electric kitchens (including combination cabinet, sink, stove, and refrigerator)
17. Ornamental clock faces and electric clock works therefor
18. Radiator enclosures
19. Outdoor transformer vaults—pads—enclosures
20. Painting and code marking of all conduit and piping, both covered and uncovered, in "finished" rooms *as defined or scheduled*
21. Painting of mechanical and electrical equipment which is not factory finished, in "finished" rooms *as defined or scheduled*
22. Water and electricity for construction purposes and for testing piping and equipment. (Service lines and connections are not in General Construction Contract)
23. Fuel for temporary heating

HEATING & VENTILATING CONTRACT

1. Demolition of heating & ventilating piping and equipment
2. Excavation and backfill for heating & ventilating work
3. Supports for heating piping on filled ground
4. Manholes for heating work
5. Cost of cutting, patching, restoring, and refinishing paving and lawn areas which have been disturbed after completion to permit installation of heating work. Such restoration is to be done by General Contractor who shall be reimbursed by Heating & Ventilating Contractor
6. Breeching and thimbles to masonry flues
7. Foundations and pads for heating & ventilating equipment
8. Mechanically operated louvers
9. Roof ventilators and exhaust hoods connected to ductwork, including all counterflashing, but not including base flashing of such equipment nor the base flashing of curbs on which such equipment may be installed
10. Counterflashing of the heating pipes and the ducts passing through roofing
11. Anchor bolts, hangers, inserts, sleeves, thimbles, and other devices for installing and supporting heating & ventilating piping and equipment, including placing and maintaining such devices in proper position
12. Access panels (*not* shown on architectural or heating & ventilating drawings) wherever required for access to control valves, etc.
13. Sleeves for heating pipes passing through floors, walls, partitions, and roof
14. Flanged sleeves for heating pipes passing through membrane waterproofing; caulking between sleeves and pipes
15. Cost of cutting holes, chases, recesses, and openings in construction materials, and cutting, patching, restoring, and refinishing of finish materials, to permit the installation of the heating & ventilating materials, if proper and sufficient information for forming such holes, etc. was not given to the General Contractor prior to commencement of the General Contractor's work. All such cutting, patching, etc. is to be done by General Contractor who shall be reimbursed by Heating & Ventilating Contractor
16. Stamped grilles and registers connected to ductwork and equipment
17. Control wiring for heating, ventilating, and air conditioning systems
18. Service lines, with connections, to all fixed equipment furnished and installed under this and other contracts, such as the following:
 - Food preparation equipment
 - Food service equipment
 - Science classroom equipment
 - Laboratory equipment
19. Equipment and labor for temporary heating after building is permanently closed in, as specified in "General Conditions." (Necessary fuel will be provided by the General Contractor)
20. Generators and other temporary equipment for electric welding of work under Heating & Ventilating Contract
21. Painting and code marking of heating piping, ductwork, and equipment in "unfinished" rooms *as defined or scheduled*

materials and the subsequent refinishing. Note that this item — marked for convenient reference — is listed under all four contracts. Other items may be listed in a similar fashion under some or all of the contract headings. In fact, a number of items appear just once under a single heading and are included only because they can be the subject of frequent disputes.

Any firm using this type of check list must, of necessity, work out its own specific form. The list shown is indicative of typical problems, but must be altered to include situations unique to a given firm's area of specialization. A final form can be perfected only through regular usage, but it will more than earn its way in client satisfaction and peace of mind for the consultant. □

Items Of Work To Be Included In Each Of The Prime Contracts

PLUMBING CONTRACT

1. Demolition of plumbing equipment and piping
2. Excavation and backfill for plumbing work
3. Supports for plumbing piping on filled ground
4. Manholes for plumbing work
5. Sewer line from end of subsoil drains under basement floors and footing drains, from a point 5 feet outside building, or from limit of contract shown on drawings
6. Concrete and/or masonry structures required in connection with storm water drainage
7. Cost of cutting, patching, restoring, and refinishing paving and lawn areas which have been disturbed after completion to permit installation of plumbing work. Such restoration is to be done by General Contractor who shall be reimbursed by Plumbing Contractor
8. Temporary water lines and connections and meter for construction purposes. (General Contractor will pay the cost of all water used by all trades)
9. Breeching and thimbles to masonry flues
10. Foundations and pads for plumbing equipment
11. Lead pans under all individual shower stalls and under receptors in janitor's closets. (Membrane waterproofing of group shower rooms is by General Contractor)
12. Floor and shower drains including flashing *if of lead*
13. Precast cement or terrazzo receptors for shower stalls and janitor's closets
14. Prefabricated metal shower stalls
15. Access panels (*not* shown on architectural or plumbing drawings) as required for access to control valves, etc.
16. Vents for linen chutes and rubbish chutes
17. Roof drains (including flashing *if of lead*)
18. Counterflashing of plumbing passing through roofing
19. Hose cabinets and fire extinguisher cabinets, including hose, extinguishers, and other equipment
20. Anchor bolts, hangers, inserts, sleeves, thimbles, and other devices for installing and supporting plumbing piping and equipment, including placing and maintaining such devices in proper position
21. Wrought iron or steel rain conductor shoes
22. Sleeves for plumbing pipes passing through floors, walls, partitions, and roof
23. Flanged sleeves for pipes passing through membrane waterproofing; caulking between sleeves and pipes
24. Cost of cutting holes, chases, recesses, and openings in construction materials, and cutting, patching, restoring, and refinishing of finish materials, to permit the installation of plumbing materials, if proper and sufficient information for forming such holes, etc. was not given to the General Contractor prior to commencement of the General Contractor's work. All such cutting, patching, etc. is to be done by General Contractor who shall be reimbursed by Plumbing Contractor
25. Generators and other temporary equipment for electric welding of work under Plumbing Contract
26. Painting and code marking of plumbing piping and equipment in "unfinished" rooms *as defined or scheduled*
27. Drain lines, with connections, to all fixed equipment furnished and installed under this and other contracts, such as the following:
 - Food preparation equipment
 - Food service equipment
 - Science classroom equipment
 - Laboratory equipment

ELECTRICAL CONTRACT

1. Demolition of electrical wiring, conduit, and equipment
2. Excavation and backfill for electrical work
3. Concrete foundations for outside lighting standards
4. Outdoor transformer vaults—pads—enclosures
5. Manholes and handholes for electrical work
6. Cost of cutting, patching, restoring, and refinishing paving and lawn areas which have been disturbed after completion to permit construction of electrical work. Such restoration is to be done by General Contractor who shall be reimbursed by Electrical Contractor
7. Foundations and pads for electrical equipment
8. Cost of cutting holes, chases, recesses, and openings in construction materials, and cutting, patching, restoring, and refinishing of finish materials, to permit the installation of electrical materials, if proper and sufficient information for forming such holes, etc. was not given to the General Contractor prior to the commencement of the General Contractor's work. All such cutting, patching, etc. is to be done by General Contractor who shall be reimbursed by Electrical Contractor
9. Anchor bolts, hangers, inserts, sleeves, thimbles, and other devices for installing and supporting conduits and electrical equipment, including placing and maintaining such devices in proper position
10. Sleeves for conduit passing through floors, walls, partitions, and roofs
11. Flanged sleeves for conduit passing through membrane waterproofing; caulking between sleeves and conduit
12. Counterflashing of conduit passing through roofing
13. Access panels to conduit spaces
14. Feeder circuits to outside signs
15. Feeder circuits to motors, starters, and control panels for mechanical systems
16. Wiring and connections to all electrically operated equipment and all equipment requiring electric service, which is furnished and installed by other contractors
17. Providing and maintaining temporary electric service, including lamps, for construction purposes. (Electric current will be paid for by General Construction Contractor)
18. Painting and code marking of electrical raceways and equipment in "unfinished" rooms *as defined or scheduled*
19. Cost of standby electric service for maintaining electrical equipment during operation of the permanent heating equipment before acceptance by Owner



Specifications

- Who Writes Them
- How They are Written

A Committee of One-Hundred Report

A REPORT FROM THE COMMITTEE OF ONE-HUNDRED. Who is the man responsible for specifications in a consulting engineer's office? Who decides on the materials and equipment, the quality, the manufacturer, and the standards of workmanship going into a project? How does a consulting engineer make sure his specifications are complete, current, and clear. The answers to these and other questions about specifications will be found in this report, based upon a recent survey of CONSULTING ENGINEER'S Committee of One-Hundred.

The Committee of One-Hundred is made up of prominent engineers from all parts of the country. They represent all sizes of firms and fields of specialization. This report is a composite of their thinking. It is not the opinion of any one man, but all of them will agree with most of it, and most will agree with all.

THERE IS NO QUESTION as to who is responsible for writing the specifications and selecting the products used in engineering projects designed by consulting engineers. According to the Committee of One-Hundred, the man who writes the specifications is a principal in the firm. This means the owner, a partner, the project manager, or a department head. In the small and medium size firms this responsibility is, in almost every instance, that of the owner or a partner. In large firms, project managers and department heads, who are always registered, responsible, and experienced engineers, decide what products go into their projects, but even among the giants there is always a partner or an officer to approve major equipment selections or changes from the firm's accepted standards.

In the small firms every aspect of engineering design falls on the owner. In the large firms the owners, partners, and principals who make the final decisions draw upon the experience of the engineers

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around them. Procedures differ slightly from firm to firm, but generally speaking, in most large firms, all of the registered professional engineers in the office are expected to be thoroughly familiar with manufacturers' catalogs, brochures, and technical data sheets as well as particular standards issued by the various industry associations and technical societies. As a result of this familiarity with the technical literature, they should be in a position to know what is available, and how it should be described in the firm's engineering specifications and on the drawings.

Design engineers, department heads, and project engineers, as a result of their engineering knowledge and experience, are expected to know the performance history of particular products and the record of reliability of the manufacturers and suppliers. Owners and partners, themselves, must have a high level of engineering judgment that permits them to select the proper equipment and materials for their client's products.

These decisions are not made individually for each item on the specifications. That would be an impossible task. Instead, most firms establish lists of quality standards, acceptable manufacturers, and approved products—these lists being developed over the years and under the direct supervision of a principal of the firm. Then, when project specifications are written, the actual products to be used are selected from this list.

Major items such as boilers, air conditioning systems, heavy electrical equipment, or unusual process components are studied thoroughly and selected by top engineering management. Even on smaller items and auxiliary equipment, the decision rests with one of the consulting firm's key men if there is any deviation from the standards or traditions of the firm.

This retaining of responsibility for product selection by firm principals is not a matter of mere refusal to permit men down the line to make decisions. The client-engineer relationship, even in the large firms is a personal one, and when a client engages the firm of Peterson, Henderson, Jones, and McGraw to handle his project, he expects Peterson, Henderson, Jones, or at least McGraw to know exactly what is going into his new undertaking right down to the washers in the lavatory water faucets.

As one member of the Committee puts it, "The responsibility for specifications rests upon the principal to whom the client looks for the successful completion of his project. Specifications are as important as the design, and they should be drawn up by someone who is thoroughly competent by training and experience. That means a principal of the firm. No one can substitute for him in this vital aspect of his work."

Client Influence

Firms of consulting engineers will differ somewhat according to the type of work they do as well as according to size of firm. The firms that do mostly electrical design agree that the client seldom shows any personal preference as to product or manufacturer. The layman (or even the plant engineer) seldom claims great knowledge in electrical matters. Mechanical engineers have a little more trouble with client preferences. For some reason the owners or the top management of industrial plants (who readily confess their ignorance as to the intricacies of transformers or switchgear) not infrequently feel they are fully capable of selecting the proper pump or compressor. Sanitary engineers constantly meet aldermen or councilmen who have been sold or in some way influenced by a glib sales representative handling some type of equipment used in sewage treatment or water works.

Every kind of engineer, it would seem, is from time to time brought under client pressure when writing specifications. Sometimes it is unavoidable. Money, for example, can dictate specifications. If the client has only \$1 in the bank, he cannot afford a \$2 project, so the engineer must cut quality until the cost matches the ability of the owner to pay. If cost is such an extreme problem that the engineer cannot design a satisfactory job, he should turn down the work.

Pressure — Under Control

Most other client influence factors are controllable. If the client has a brother in the valve business and instructs the engineer to use the brother's valves, then there are two possibilities: the brother's factory makes excellent valves well suited to the project, or the brother's factory makes lousy valves not suited to the project. In the event that the first is true, then the Committee feels that the engineer should be cooperative enough to go along with the client's desires. If the second is true, the engineer should refuse to include the valves in his specifications and talk the client out of his patronage plan. If this is impossible, he should get, in writing, a statement from the client pointing out that the inclusion of the valves is against the best judgment of the engineer and he is in no way responsible for their performance. Even this is not always satisfactory, for a year or two later, when the valves fail, the owner, in his conversation with his friends (the engineer's potential clients) is likely to mention the failure but forget the responsibility.

There is one other form of client influence that is perfectly reasonable and should be respected by the consultant. When the owner already has one type of equipment installed and it is performing properly, the consultant should try to specify the same equipment for a new project. By doing this he can reduce the cost of stocking replacement parts and cut maintenance costs.

Despite these client influence factors, few consultants complain of frequent interference in product selection. The consultant is being paid to write the specifications, and most clients have sense enough to let the engineer earn his fee. As a result, this responsibility falls upon the engineering firm and comes to rest on the shoulders of a partner or principal. This is illustrated by three quotes from the comments of the Committee of One-Hundred.

First, a small firm:

"It is not hard to see who is responsible for specifications in my office. Except for two draftsmen and a stenographer, I am the only person in the place. Since I am the only registered engineer, I am fully responsible for both design and specifi-

cation, and I select every item personally. I have found that the only way to define clearly the type and quality of equipment I want is to specify by brand name and catalog number. I do use the phrase 'or approved equal,' but the approval must come before the bidding so that every contractor knows what he is bidding on."

And a medium size firm:

"In our firm we have three partners and one chief designer, and it is one of these four who decides which products will be specified. The draftsmen, specification writers, designers, and others in our office may provide information leading to the specification of a particular product, but they cannot make a decision without the approval of one of these four top men."

Finally, the large firm:

"Ours is a large consulting firm, and the various department heads are responsible for preparation of the first draft of specifications covering their phase of the work. These suggested specifications then are sent to the project manager for his study and approval. The final decision rests with this project manager, who is a partner or principal in the firm. The role of the client with respect to specification is usually one of relying on the engineer's judgment. There are, however, a few exceptions which include: reciprocity requirements because of previous business or sales policies of the client; bad experience or poor service with a particular product on the client's premises; personal preferences based on social or other nonengineering reasons. We have no objection to abiding by the client's wishes if the product in question is of the proper type and quality. If not, we usually can talk him out of his ill-conceived preference."

The Process of Preparation

Just exactly how does a consulting firm go about the physical job of preparing a set of specifications for a project? The comments of the Committee show that all consulting engineers use one of several kinds of guides when they sit down to write specifications for a new project:

- Standard specifications developed over the years for various types of projects
- Skeleton specifications to guide the writer
- Card files showing standards for each of the different items of equipment frequently specified
- Specifications of similar previous projects to guide the writer in preparing new copy
- Lists of acceptable brands and manufacturers
- Standards, codes, and data sheets prepared by manufacturers, manufacturers' associations, and technical or professional societies

The firms of the members of the Committee of One-Hundred are about evenly divided in their

use of some standard or master, or skeleton specifications guide as opposed to reference to prior specifications for similar type projects. The trend would appear to be toward the development of standard specification guides, though there are some arguments against them. "They are too often neglected," say the opponents. "They are always out of date. It is much better to use a specification for a recently completed project, thereby keeping a constantly current guide before the writer."

Some Favor Standard Guides

But, say the proponents of the standard guides, "a firm's standard or master form need not be out of date. We review and revise ours regularly. Changes are made daily, and the whole set of standards is studied monthly. Besides, these are simply outlines that require study of all conditions peculiar to the current project whereas old specifications used as guides are all too likely to encourage the writer to simply copy paragraphs or sections without giving serious study to differences in projects."

Obviously, it is more a matter of application than of method. Either standards or reference to old specifications can be good or bad depending upon the way they are used.

The actual practices of several outstanding firms can be understood best through the comments of the Committee.

¶ The project engineer makes full use of our guide specifications which have been developed gradually and are revised regularly by a special committee of engineers. Committee members are selected on the basis of their technical proficiency and experience, and I head the committee.

¶ We do not have a standard specifications guide, but we do have a list of products and manufacturers that are acceptable on our projects. This list shows two to six manufacturers for each type of material or equipment, and products specified must be taken from this list or the change must be approved by a partner. The list is revised from time to time, removing those who no longer meet our standards and adding any new ones that do.

¶ The senior project engineer, or one of the principals, usually suggests one or more projects of a similar nature to be used as a guide by the engineer preparing the specifications. We never have found two projects that could use identical sections, so we do not use standards. We prefer a more flexible system that combines research with experience and sound engineering judgment.

¶ We have built up office files, records, and standards which we use in our designs and specifications. Among such records are lists of approved manufacturers and contractors, approved products, and a considerable number of design data books

and standard codes and specifications. These are periodically reviewed, revised, and added to.

¶ We use standard specifications as a guide, but this is not a matter of referring to a "cookbook" and following directions. All specifications are tailored to fit the job. The standards merely assure us that we have given full consideration to every aspect of the job.

¶ Our firm uses a card index as a specification guide. This file has major divisional titles for all types of equipment. Basic specifications data are shown on white cards; acceptable alternates are on blue; new methods and products that appear to offer advantages but are not yet accepted by our firm are on pink cards. These cards are being revised constantly and are reviewed periodically by a member of the firm. He decides when the new products or methods can be accepted as basic or as alternates on our projects. No effort is made to include unusual or rarely used products in this file.

¶ Our specifications are written to conform with our standard form. Basic data under each division of our specifications include: General Conditions; Work Included; Work Excluded; Materials; Workmanship; Guarantees. In the Materials section it is our practice to specify acceptable products by trade names. An "or approved equal" clause is included in the General Provisions section. When only one product is specified by brand name, it is understood that no other product will be acceptable. A careful file of all our specifications is maintained in the office and the standard form we use is checked regularly by the department heads and partners to see how it can be improved.

¶ At one time we used to scratch up a specification from another job to fit the one in progress. This system provided too much of a margin for error or omission, and it was decided to write a set of master specifications for each trade. Each article in these master specifications was written with the intent of covering every combination of conditions which we might encounter in practice. By preparing a copy index for the typist and selecting only those paragraphs which apply, we are able to reduce the work and time required for specifications writing. Even so, it still requires a thorough knowledge of the work and plenty of longhand to write a good set of specifications. It is our practice to describe the product and its function as thoroughly as possible and then, in a separate paragraph, give a list of manufacturers who make an acceptable quality product in this category. We have found it impossible to specify quality of product, integrity of manufacturer, and other intangibles without mentioning the names of those we feel are qualified to deliver the product needed. We add to or

change our list of acceptable brands from time to time as required.

These comments show how the various firms prepare their specifications. It is interesting to note that most consultants know exactly what products they are prepared to accept, and they generally identify by brand name and manufacturer. As one member of the Committee says, "I wonder if most manufacturers realize that a consulting engineer who specifies a particular product is the best and least expensive salesman that a manufacturer has on his sales staff."

[This may not always be true, for it would seem that selling the consulting engineer is anything but easy. Manufacturers complained long and loudly about this in the article "What's Wrong With Consulting Engineers?" (*CONSULTING ENGINEER*, June 1959). They said that consultants are not willing to try anything new no matter how good it is. There are some consultants, the manufacturers claim, who take the attitude that what was good enough for the client's grandfather should be good enough for the client. — Ed.]

Broadly speaking, the engineers of the Committee of One-Hundred do not deny that they are rather hard to sell. "My clients," says one, "do not employ me to experiment with their money." We can only conclude that what the manufacturer looks upon as stodgy ultraconservatism, the consultant sees as reasonable professional responsibility. And while the consultant may demand considerable proof of product performance, it is always possible for a good product to get onto the approved list.

How New Products Make The List

How is this done? The first and most important demand of the consulting engineer is that the new material or piece of equipment have at least two years of successful performance under actual field conditions. There are exceptions to this, but this requirement is mentioned so often in the comments of the Committee that it cannot be taken lightly. Laboratory or even pilot plant performance data seldom satisfy the consultant. The consultant is willing, however, to take into consideration the good name of the manufacturer and experience with other products put out by the same company.

Some idea of the conservatism of the consulting engineer is illustrated in the statement of one consultant that "I would consider the approval of a new product if the manufacturer has a good local and national reputation, if the salesman presents his story intelligently, if he has a record of keeping his catalogs in my files up to date, and if it can be demonstrated to me that the product has a good performance record on installations in the

locality of my client's project. Admittedly, this means that we are not the first to use a new product, but only by such conservatism can we be sure that the products we specify will perform properly on the projects for which we are responsible."

It is the Client's Money

Actually, most consultants are not so opposed to the new as they sound. It is more a matter of wanting proof before they spend the client's money. Too many have been stuck too many times by products that were good in concept but insufficiently developed when put on the market. Or perhaps the product was a perfectly satisfactory one in some applications but the manufacturer wanted to use it where it did not fit. An example of this is given by one member in explaining his experience with the insulation for a new cold storage plant. "While there was no previous experience with this product as an underfloor insulation, the client wanted it, the sales representative put up a good story, the contractor favored it, and so I made the mistake of agreeing. The insulation failed. It lacked sufficient density and resistance to deflection even under a concrete wearing slab. It had to be replaced in less than a year at considerable cost to the contractor and the supplier. We, as engineers, lost all the way. We lost the owner as a client who trusted our judgment. We lost the contractor as a man who had faith in our specifications, and we lost the supplier as a friendly sales representative and subcontractor. A few experiences like this (and what engineer has not had them), and we develop a quite natural reluctance to subscribe to new products or new applications."

Another example demonstrates the attitude of the consultant. A consulting firm refused to specify a new type of heat pump for a client but then turned around and bought that system for their own new office building. They wanted to get operating experience before specifying it for others. They were willing to experiment with their own money but not with a client's.

A west coast consultant perhaps has the best answer when he says, "You can forgive a salesman for overselling, but you can't forgive a consulting engineer for believing him."

Progressive but Careful

Again, direct quotations from the Committee comments clearly illustrate the attitude of most consulting engineers toward approving new products. ¶ The only way a piece of new equipment or a new material gets into our specifications is for us to become convinced that it is the proper answer to our client's particular problem. We have to tread a narrow line between being progressive, modern,

and interested in new products and, on the other hand, holding back until we are fully satisfied that a product has a thoroughly satisfactory performance record before we accept it. We need reliable test data, field experience records, and cost information to help us reach our decision. A friendly salesman with a nice personality is nice to talk to, but if he does not have more than vague claims, he is wasting everyone's time. We want written material in our files. You cannot refer to talk when the time comes up to write specifications.

¶ When the question arises on any project of using a piece of equipment or a material which is new and with which we have had no experience, we investigate it fully and thoroughly. In many instances we go to the extent of sending a man (at our own expense, of course) to the plant where the equipment is manufactured to talk with the designers and applications engineers. We also go to existing installations to talk with operators. However, we are always much interested in new methods and equipment. We were, for example, among the first to receive an Access Permit from the Atomic Energy Commission and their clearance to work on classified projects.

¶ In answer to the direct question of whom a salesman would have to sell in order to get his new product on our specifications, the answer is one of the partners or principals. No new product would be specified until complete tests had been made and there were reasonable records of performance. That means two years for mechanical or electrical equipment and perhaps somewhat less time for certain types of construction materials, that can be tested and proven quickly.

The Proper Approach

No one would deny, however, that the procedure involved in getting onto the consulting engineer's approved list is long and hard. Beyond the essential proof of the product, there are other important factors having to do not with the product but with salesmanship as an art and a science. These involve the manufacturer's approach to advertising to the consulting engineer through trade and professional publications, direct mail advertising, and the personal contact of the manufacturer's sales representatives. All of these sales approaches are important to the consultants, and a bad job in one can spoil a good job on the other two. A good salesman, for example, can have all his fine work wiped out by a stupid piece of advertising copy offering "free engineering" to the clients and prospective clients of engineers in private practice. Or good magazine advertising can be negated by a mailing piece that starts off "Dear Mr. Contractor," or "As an Architect you know . . ."



Forrest and Cotton Decorate a Downtown Engineering Office

LUCILE AYRES PAYNE
Payne Associates, Decorators

TURNING AGAINST the trend to the suburbs, Forrest and Cotton, Inc., Dallas, Texas, Consulting Engineers, decided to stay downtown. They rented the sixth floor of the Vaughan Building, one of Dallas' newest and most modern locations.

To the decorators, "consulting engineer" connotes originality, dignity, and vision. These were the themes we tried to bring together in this office.

The visitor entering the reception area gets his first impression from the three long rows of registration certificates mounted behind plate glass held in place by horizontal moulding. These symbols of engineering proficiency of the employees and members of the firm stand out against the walnut wall, which contrasts with the parqueted vinyl floors in black, white, and coral. Sidewalls are vinyl covered in white and grey. The sofa and contemporary armless chairs are upholstered in flecked black or delph blue textiles.



Forrest and Cotton's conference room and library is located directly behind the reception area. Because this room is occupied for relatively brief periods, the colors and decorations were intensified. Basic colors are electric blue and green against a grey wall and floor. The custom-made conference table, in heat resistant walnut, is of a boat shape that dramatizes the inlaid pattern of the wood. The two walls of shelves contain jacketed books — the blue and green colors predominating. The long wall is accented by a collection of sculptured fish.

The secretaries' spacious office makes use of brilliant colors. Strong corals and mustard yellow are brought out in the upholsteries and the floral arrangements. Over-scaled sculptured dragonflies and moths adorn the blue wall above the seating area. Hanging wall fixtures swivel over each secretary's desk to provide added light and pattern.



Heavy textured cotton and linen in natural and blue drape one long wall of Carr Forrest's office. A smooth-lined sofa in iridescent blue and brown upholstery gives balance to the conference chairs in blue and brown leathers. The desk is lighted from the ceiling by three conical brass fixtures, while a brass lamp-tree lights the sofa area. On the walls are color photographs of two of Forrest's engineering projects.



Partner James Cotton's office has a warm, comfortable atmosphere with walls and draperies in muted beige to compliment the walnut paneling and furniture. An antique burled lacewood tea caddy and a pair of cherry urns adorn the classic walnut cabinet at one end of his office. Audubon scenes hang above the saddle-brown leather sofa. Soft celadon green leather covers on chairs and muted coral toss cushions on the sofa are used as accents.





We Need a New Service Voltage

If we are to change to
a higher voltage, should we
choose 265/460 or 240/416
. . . and for what applications?



A. S. ANDERSON
Electrical Engineer
Ebasco Services Inc.

A. S. Anderson has specialized in the engineering, operation, and research of distribution systems since his graduation from Massachusetts Institute of Technology, where he earned B.S. and M.S. degrees in Electrical Engineering. He spent almost 15 years with the New Orleans Public Service Company before joining Ebasco in 1939. Since that time he has worked in all phases of electrical distribution and has authored a number of engineering manuals and methods and organization studies. Anderson is a Fellow in AIEE; a member of the American Society of Heating, Refrigerating and Air Conditioning Engineers and the American Wood Preservers Association; and a Professional Engineer in N. Y.

AT THE BEGINNING of this decade, the service voltage offered by utilities was basically 120 volts to neutral. Since **C_E exclusive** then a new and higher voltage has come into use and now is offered by nearly all utilities with metropolitan loads. This service — basically 265 volts to neutral — is being made available to large commercial buildings. The 120 volts to neutral translates into a three-phase voltage of 208 volts whereas the 265 volts to neutral translates into a three-phase voltage of 460 volts.

Because the 460-volt system had been used in factories since the late '30s, and particularly in large new war plants in the '40s, its emergence as a service voltage furnished by utilities did not draw much attention. It should have, since it was the first time that utilities in this country began furnishing a utilization voltage that needed further transformation to serve single-phase loads. In other words, it was a utilization voltage that was suitable for 440-volt three-phase motors, but all other loads required further voltage transformation. However, it has savings in wiring costs up to 35 percent as compared to the 120/208-volt system because the

voltage level is more than double, provided it is applied selectively.

The acceptance of the 460-volt three-phase system by utilities for commercial application seems to have spread rapidly since the American Institute of Electrical Engineers included a "Symposium on Higher Distribution Voltage for Metropolitan Areas" on the agenda of its 1954 Fall General Meeting. Eleven papers were presented, showing the economic advantages of the 460-volt system as compared to the 208-volt system, and further indicating that it was feasible to operate 460-volt isolated systems in areas already served by 208-volt systems.

The economic attractiveness of the 265/460-volt system led to its application to all new commercial buildings in some cities. Utilities began to offer it as a service voltage which was available in certain areas or for loads of certain minimum demands. This level of voltage seemed to be well on its way to universal acceptance and eventual standardization.

However, papers and reports began to appear in the technical press in 1956, 1957, and 1958 based on engineering studies of the relative merits of 240/416 volts as compared to 265/460 volts for three-phase service and 240/480-volt systems for residential service. During this period a joint engineering committee of the Edison Electric Institute and the National Electrical Manufacturers Association also was studying the problem for the purpose of standardization.

New Voltage Standard Preferable

Reports in the technical press of the various engineering studies generally concluded:

- ¶ That higher utilization voltage was not only feasible but more economical for high density single-phase residential loads.
- ¶ That 240/416 volts was preferable to 265/460 volts as a three-phase system to be used by utilities for serving commercial buildings, stores, shopping centers, apartment houses, and other establishments requiring three-phase service.

In the March 1959 issue of the *Edison Electric Institute Bulletin*, an item states that Mr. T. C. Duncan, EEI cochairman of the EEI-NEMA Joint Committee on Higher Secondary and Utilization Voltages, distributed a preliminary report to the Transmission and Distribution Committee of EEI for review and criticism. The same report also was to be referred to NEMA sponsoring organizations by the NEMA cochairman. This draft recommended the adoption of 240/480-volt single-phase and 240/416-volt three-phase systems as preferred standards for residential and general use with the 265/460-volt three-phase system as an alternate standard for larger commercial and industrial electrical loads.

These tentative recommendations, as well as the aforementioned engineering reports since 1956, are based on the broader viewpoint that all or nearly all usage in the home, store, church, school, office, and factory eventually, might be at a higher level of utilization. This is contrary to the viewpoint on which the sole use of the 265/460-volt system is based, i.e., higher utilization voltage should be applied selectively.

Realistic Growth Forecast Needed

Any realistic forecast of the growth in the use of electricity should be very optimistic. Optimism is particularly justified when considering the growing acceptance of air conditioning, electric heating by heat pumps or resistance heating units, water heating, and labor saving devices in the home. Add to this refrigeration and high level lighting for the commercial establishment or school. All this plus the fact that electric utilities are extremely active in promotional activities for the all-electric home justify this optimism. Forecasts which visualize the increase in the number of all-electric homes by six times in 10 years and doubling the average usage in all homes seem very realistic. The same optimism seems well founded for commercial establishments. Such a realistic viewpoint toward the ever increasing use of electricity for domestic and commercial purposes gives strong support to the need for a higher utilization voltage.

Practically all countries in Europe — including the United Kingdom — as well as Australia and a larger part of the rest of the world have adopted higher utilization voltages. A very recent report from Sweden indicates that 220/380 volts is used almost exclusively in rural areas and that 98 percent of the towns and cities have this voltage available; 75 to 80 percent of energy used for residential and commercial purposes is supplied at this voltage.

In taking a similar positive attitude in this matter of utilization voltage and recognizing the need for a level higher than 120 volts to neutral, however, certain factors must be kept in mind. Higher levels of utilization voltage should meet the following requirements to best satisfy the need, convenience, and cost interests of both the residential and the commercial consumer:

- ¶ It should be safe.
- ¶ It should be more economical than present 120-volt systems.
- ¶ It should be compatible with present standards.
- ¶ It should cause a minimum change in design.
- ¶ It should show savings in building wiring costs.
- ¶ It should be a true utilization voltage, i.e., avoid the need for further transformation by consumers.

The higher level also should show savings for the utility which is to furnish and maintain the trans-

formers, secondary wires, service wires, and meter. The higher level should be acceptable to the manufacturer since he will be expected to change designs of equipment and have equipment readily available for present and proposed standards.

Appliances Will Use Higher Voltage

The studies made by Ebasco Services Incorporated show that the voltage level that will fulfill these requirements most successfully is 240 volts to neutral. For residential consumers the best system is a three-wire 240/480-volt single-phase secondary with two-wire 240-volt services. Autotransformers should be used on the consumers premises for serving 120-volt equipment. Under the proposed system, two-wire 240-volt branch circuits and equipment connected directly to them will have 240 volts between the "hot" wire and ground. Under the present system, two-wire 240-volt branch circuits and equipment connected to them have 120 volts to ground.

It may be expected that much of the large home equipment such as refrigerators, electric sinks, and washing machines will be adapted to 240 volts. The trend toward built-in equipment also should be an incentive to use 240 volts. Therefore, as time goes on, autotransformers will get smaller. We believe that they eventually will disappear, and all usage will be at 240 volts. However, there are some engineers who believe that there always will be need for 120 volts. This difference in opinion, however, need not deter the acceptance of the proposed system. On this point there is majority agreement.

Higher Voltage Can Be Safe

The safety aspects of utilizing 240 volts for portable devices has and will be debated at considerable length. A symposium was held on the subject — "Symposium on Safety Considerations in the Proposed Use of Higher Secondary and Utilization Voltages" — at the Winter Meeting of the American Institute of Electrical Engineers. H. H. Watson, chairman of the Safety Committee of AIEE summarized the opinions of 18 speakers who took part in this symposium in AIEE Paper CP 58-1209. It is significant that 15 of the 18 speakers felt that a higher level of utilization voltage could be made as safe as the present standard lower level.

Everyone will agree that contact with a 240 volt to ground circuit will give greater shock than contact with a 120 volt to ground circuit. The solution then, to greater safety at either voltage, is to reduce the number of contacts. The same means must be taken to reduce contacts at either voltage, and it is to be expected that the net gain in safety will outweigh the extra hazard of double voltage. For example, a convenience outlet near a radiator is a potential source of danger to a small child who

begins poking around with a key. It is a possible lethal situation that can be entirely eliminated. The hazard is slightly different for the two voltages, but the solution is the same and equally effective for either voltage.

Safety Improvements Needed

Most dangerous of all contacts in and about the home are those in which the body is in the path to ground. In most contacts, this ground is extraneous to the electric system. Potentially dangerous situations where such contacts might occur on a single contingency basis must be recognized and eliminated. If two contingencies are required before contact is made, we will achieve a higher degree of safety than now exists at the lower voltage. It requires no more ingenuity, education or code enforcement at 240 volts to ground than 120 volts to ground to eliminate dangerous situations or provide double protective barriers in others. The same insulation is required for both voltages since the insulation level is 600 volts. In some instances, the leakage distances may need to be increased for the higher level, but generally the cost of doing this will be insignificant.

There are ways of improving the safety at 120 volts to ground and most of these will be equally effective for 240 volts to ground. The cost of doing so is about the same for either voltage. The contemplation of the higher level will spur the adoption of various measures to improve safety. This has been the experience in other countries and should be the experience here.

Electrical Industry Faces Problem

The electric industry is seriously considering the adoption of two higher levels of three-phase voltages as indicated by the preliminary report of the EEI-NEMA Joint Committee studying this subject. It also recognizes the need for general use of 240 volt to grounded neutral circuits in utilization wiring and the advantages of a 416-volt rating for three-phase motors.

Eventual acceptance of temperature and humidity control where people live, work, and play; much higher levels of lighting; snow melting; general acceptance of labor saving equipment; and innumerable devices of convenience and entertainment are the tangible possibilities on which the most optimistic forecasts can be predicted. Never before in history have so many been engaged in research. From this should come unpredictable uses of electricity. All this predictable and unpredictable increase in the use of electricity is a sufficient basis for the farsightedness of the work being conducted by the EEI-NEMA Joint Committee on Higher Secondary and Utilization Voltages.

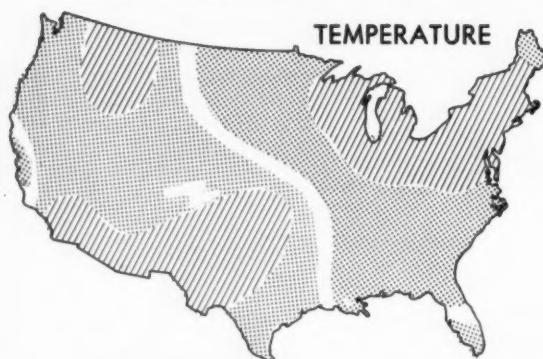
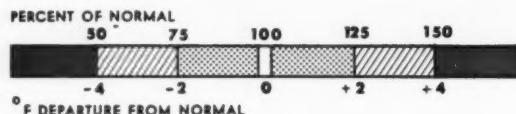
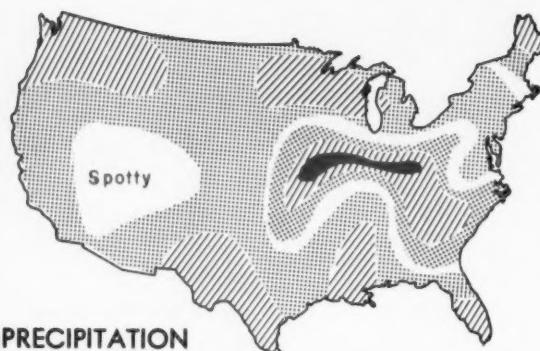




KRICK WEATHER OUTLOOK

AUGUST 1959

Prepared Exclusively for CONSULTING ENGINEER

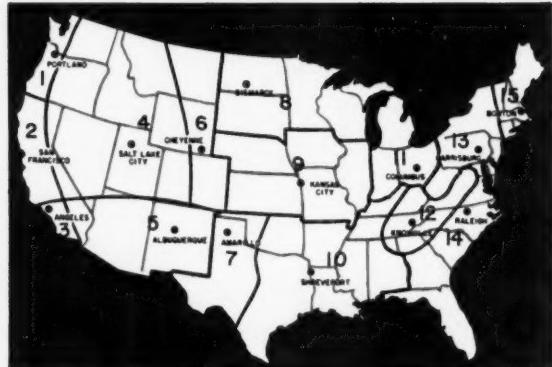


AUGUST HIGHLIGHTS

During August, near seasonal construction weather is expected over much of the United States. Although the northeastern portions of the country are likely to be slightly cooler than normal, unusually cold temperatures are not anticipated. These cooler readings should be the result of frequent cloudiness, and scattered intermittent shower activity which should tend to lower the daytime high temperature readings. The western half of the country is expected to have slightly warmer than average temperatures. Generally, drier than normal conditions should accompany these warmer temperatures over the west. The nation's driest areas, as compared to normal, are likely in the Northwest, the Great Lakes region, and also down in the Big Bend areas of the Rio Grande. The number of favorable construction days might be somewhat lessened in some valleys of Utah, and its immediate surrounding states, as frequent threatening showers could bring above normal moisture to isolated localities. The major exception to the near normal construction day trend is likely in the area extending from the mid-Atlantic coast westward to the eastern portions of Kansas and Oklahoma. Since much above normal moisture is contemplated over sectors of this region, construction weather could be hampered. Favorable working weather is expected to be disrupted slightly throughout the New England area as heavier than normal amounts of rainfall are expected. With the exception of those areas in which above normal rainfall is expected, look for favorable construction weather over the nation during August.



TEAR OUT ALONG PERFORATION.



CONSTRUCTION DAY CRITERIA

To be considered a construction day on these charts, the day's maximum temperature must be more than 38 degrees. There must be less than six inches of snow on the ground. There must be less than six hours of active precipitation during the period between the hours of 7 a.m. and 5 p.m. There also cannot have been more than one inch of rainfall on the preceding day.

CONSULTING ENGINEER

These forecasts are prepared by Irving P. Krick Associates, Inc., the world's oldest and largest weather engineering firm. The forecasts are based on methods developed by this group at California Institute of Technology prior to World War II. After the War, the methods were adapted to high speed electronic computing machines to shorten the time required to solve the complex problems of the atmosphere. Ultra-long range forecasts, up to a year or more in advance, are now available. Information on other Krick weather services is available by writing to the home office of the firm at 460 South Broadway, Denver, Colorado.

CONSTRUCTION DAYS

LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	31	31	31	31	31	31	31	31	31	31	30	31	30	31	31
LOWEST	27	29	29	28	30	27	27	26	26	26	26	27	26	27	20
AVERAGE	30	31	31	30	31	30	30	29	28	30	29	30	29	28	27
ESTIMATE	30	31	31	31	31	29	30	30	28	27	28	30	27	29	26

These estimated construction days for key cities in the United States should be interpreted as an average of estimated conditions over the forecast area. To obtain the best results, the forecast number of construction days should be compared with the temperature and precipitation anomaly maps and the timing estimates to determine the probable number of construction days in your locality. The forecast construction days are based on average construction day requirements as defined under "Construction Day Criteria," and should be adjusted for individual operations.

LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	30	30	30	30	30	30	30	30	30	30	30	30	30	29	30
LOWEST	26	30	28	28	28	25	25	25	27	26	28	25	22	24	27
AVERAGE	27	30	30	29	30	30	28	29	28	29	29	28	26	27	29

LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	30	31	31	31	31	31	31	31	30	31	31	31	31	30	31
LOWEST	16	28	29	25	30	25	26	21	26	26	28	25	26	28	22
AVERAGE	25	30	31	29	31	29	30	28	28	29	29	29	29	29	27

*Historical Average, Not a Forecast

AUGUST 1959 TIMING OF SIG

WASHINGTON OREGON	PRECIPITATION					
	DAY OF MONTH	1	5	10	15	20
	TEMPERATURE					

Generally, a much drier than normal August is anticipated over this two state area. Look for important rainfall during the 7th-10th interval. The heavier amounts of moisture during this stormy period are likely to occur principally over Washington.

IDAHO - MONTANA WYOMING	PRECIPITATION					
	DAY OF MONTH	1	5	10	15	20
	TEMPERATURE					

The showers expected during the 10th-13th interval should effect principally northern areas. Although Idaho and southern Wyoming are likely to receive showers a day or two following this period look for briefly cool temperatures in northeastern areas near the 21st.

CALIFORNIA NEVADA	PRECIPITATION					
	DAY OF MONTH	1	5	10	15	20
	TEMPERATURE					

Near to slightly warmer than normal conditions are expected over this two state area during August with the exception of Nevada and mountain areas where some showers are likely. Mostly cloudy, threatening skies are anticipated over the area.

ARIZONA - UTAH COLORADO NEW MEXICO	PRECIPITATION					
	DAY OF MONTH	1	5	10	15	20
	TEMPERATURE					

Slightly warmer than normal average temperatures are on tap over this four state area during August. The showers indicated a day or two around the 21st and the 25th should concentrate principally in eastern Colorado, eastern New Mexico, and Utah.

MINNESOTA N. & S. DAKOTA	PRECIPITATION					
	DAY OF MONTH	1	5	10	15	20
	TEMPERATURE					

Cooler and drier than normal conditions are contemplated over this entire three state area during the month of August. Look for important general showers for at least a day or two around the 12th, and again around the 24th of the month.

NEBRASKA KANSAS IOWA - MISSOURI	PRECIPITATION					
	DAY OF MONTH	1	5	10	15	20
	TEMPERATURE					

Look for much above normal rainfall in the southeastern sectors of this four state area with drier conditions likely in the north and west. A prolonged interval of moderately hot weather should persist between the 13th and 19th of August.

WISCONSIN MICHIGAN-INDIANA ILLINOIS - OHIO	PRECIPITATION					
	DAY OF MONTH	1	5	10	15	20
	TEMPERATURE					

Generally, cooler and drier than normal is the outlook over the Great Lakes region during August. Frequent cloudy weather is expected during the month. However, mostly widely-scattered showers are likely to accompany this threatening weather.

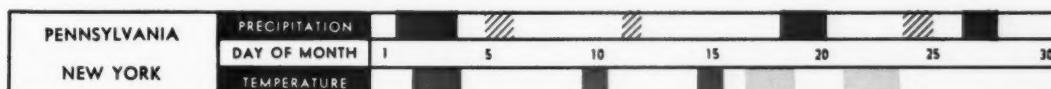
SIGNIFICANT WEATHER EVENTS

RAIN	
SHOWERS	
WARM	
COOL	

The timing bars below are intended to indicate periods of important general storminess and important departure from temperature normals in areas indicated. They are highly accurate over the area indicated, but are too general to pinpoint small local storminess or showers. Allow one day on either side of indicated storm or extreme temperature periods for general planning. Combination rain or snow shading indicates either one or both.



Cooler than normal average temperatures accompanied by near normal rainfall is the outlook over this area during the month of August. Look for a slight warming trend east of the Appalachians on a day or two following the 5th of the month.



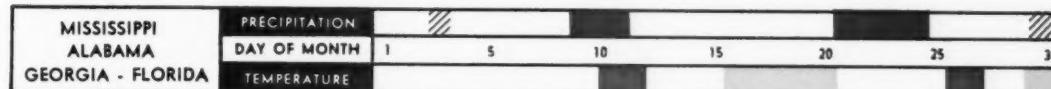
Near to slightly below normal rainfall is anticipated over this two state area during August. Look for the heavier moisture amounts as compared to normal in northern portions. Important storminess is likely around the 2nd-3rd, 19th-20th, and 27th-28th periods on the timing bar.



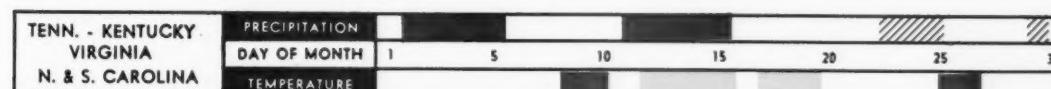
Generally, slightly above normal moisture is contemplated over New England during August. The heavier moisture totals as compared to normal are likely in northern portions. Look for average temperature readings to range slightly cooler than normal over the area.



The storminess indicated a day or two around the 12th is likely to concentrate principally in the north-central and panhandle areas of Texas and Oklahoma. Look for the cool interval indicated a day or two around the 19th to be more prominent in northern portions.



Over Florida, showery weather should be more frequent than indicated. The heavier amounts of rainfall as compared to normal are likely in northern portions. Northern sections are likely to receive showers a few days following the 5th of the month.



Slightly cooler than normal average temperatures are expected over the Upper South. Look for the showers during the 12th-16th interval to be heavier in northernmost sectors. Hot, humid conditions are expected during the week following the 11th.

New Cleveland water filtration plant
is Powered-Up to serve industrial
and residential expansion



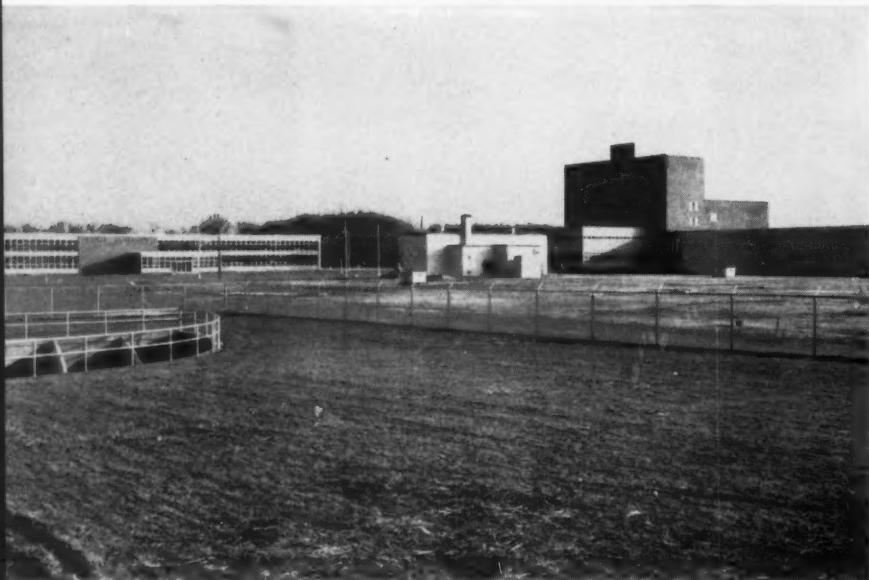
YOU CAN BE SURE...IF IT'S **Westinghouse**

Cover photo:

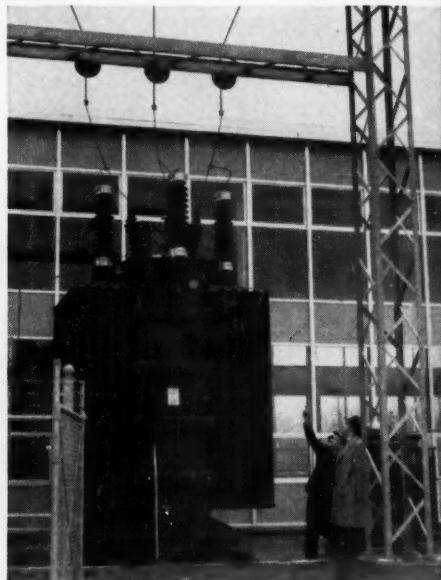
View of raw water pump suction wells illuminated by Westinghouse VEK-16 floodlighting.

Project group discussing layout of Crown Filtration Plant includes J. E. Hrovat, Vice President of Engineering, Doan Electric Co., Electrical Contractors; E. E. Croushore, Westinghouse Construction Sales Engineer; L. O. Meyer, Branch Sales Manager, WESCO, Cleveland; Dan Kasych, Assistant Superintendent, Pump Building; G. L. Baughman, Chief Electrical Engineer, Havens and Emerson, Consulting Engineers; S. C. Simmermacher, Chief Mechanical Engineer, City of Cleveland; M. B. Trimble, Westinghouse Construction Sales Engineer; E. S. Goulder, President, Doan Electric Co.; and H. M. Stafford, Salesman, WESCO, Cleveland.

J-94123-2



Over-all view of Crown Filtration Plant, Cleveland, Ohio. Pump building is at left and the filter building at right. Westinghouse OV-20 street lighting was provided for plant entrances and roadways.



Dan Kasych and E. E. Croushore examine one of the two Westinghouse 5000-kva power transformers which step incoming 34.5-kv service down to 4160 v for main pump drives.

• Westinghouse system provides for 100% electrical load increase in new water pumping station

The new Crown Filtration Plant was designed to meet the growing need for water supply in the westerly suburbs of Cleveland, Ohio, and, as an important part of that planned expansion, the Westinghouse electrical system presently installed provides for 100% load increase without adding to the system.

The pumping station-filtration plant is located on a 55-acre site and is the newest addition to the city's expanding water supply system. Construction was started in 1953 and completed in 1958, and represents nearly a \$20,000,000 investment. Present plant capacity is 50 mgd; but, because of anticipated future requirements, the plant has space and provision for additional equipment to provide capacity of 100 mgd.

Raw water is obtained through a crib $2\frac{1}{2}$ miles offshore in Lake Erie. The water from the crib is carried through a connecting tunnel to a raw water well, where its handling is taken over by raw water submerged pumps. Treatment and flow of the water from this point through the filtration plant are automatic and exactly controlled, leading finally to a 15-million-gallon filtered water reservoir located in the southwest corner of the plant area. High service pumps deliver the water from the reservoir to both the low pressure zones and the first high pressure zones supplied by the Crown plant.

The major electrical elements supplied by Westing-

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Two 5000-kva power transformers—to step utility service from 34.5 down to 5 kv.

Main metal-clad switchgear—to control and distribute power to motor starters (for L.S.) and provide for starting of H.S. motors (1750 hp).

Dry-type power center—to provide 480-v service to plant auxiliaries.

Westinghouse lighting throughout the plant area, including fluorescent, incandescent, street lighting and floodlighting.

In addition, Westinghouse supplied the many lighting and distribution panelboards required in the plant's operation.

The planned Powering-Up of the Crown Filtration Plant means it can meet all foreseeable future requirements with a minimum of modification. Additional water handling and treating facilities can be installed in areas already provided for them. And all such additional equipment can be operated without adding to the existing electrical distribution system.

(contd.)

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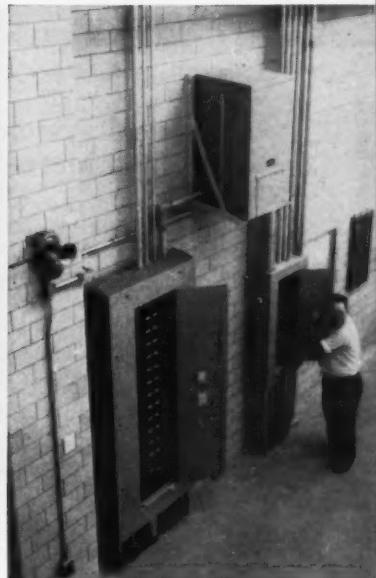


View in main switchgear room with G. L. Baughman, M. B. Trimble and S. C. Simmermacher examining Westinghouse metal-clad switchgear. Lineup at right contains main incoming line breakers, bus tie breaker, reactor starters for high service pump motors, and feeder breakers for power center and low service pump motor starters. Five-kv bus duct overhead provides connections from metal-clad switchgear to Ampgard* high-voltage fused starters at left.

*Trade-Mark



Dan Kasych inspects switchgear room. Westinghouse 225-kva power center utilizes dry-type transformers and DB low-voltage air circuit breakers to supply power panels throughout pump building. Room lighting is Westinghouse 2 SPC-75 slimline fluorescent luminaires.



Westinghouse CDP power distribution panelboard and wall-mounted 37.5-kva dry-type transformer feeding NLAB lighting panelboard. J-94123-3



• (contd.)

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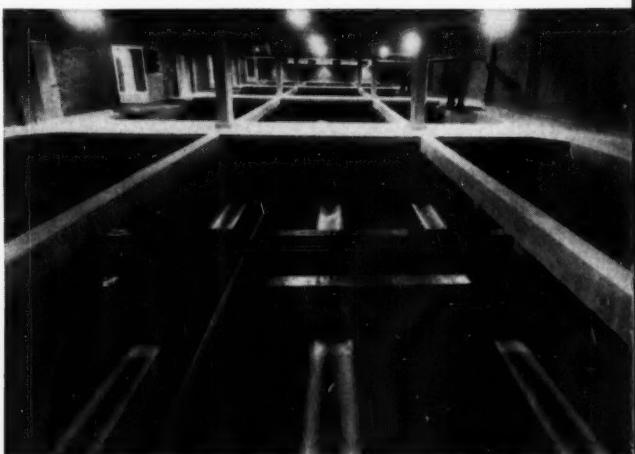
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Section of main pump floor showing the three 25-mgd high service pumps and three 8-mgd low service pumps which are presently installed. Metal-clad switchgear cubicles and Ampgard high-voltage starters for these and two additional future pumps of each rating are installed in the main switchgear room. High bay mercury-vapor lighting is provided by Westinghouse Millite® luminaires.

View in filter building showing row of clarified water filter beds. Under average flow conditions, the 12 filters in the plant will pass a total of 50 mgd. Lighting is supplied by Westinghouse VEK-16 floodlights.



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Atoms in Action

A Visit With Dr. S. Baron to
The Russian Exhibition of Science
New York City Coliseum

MARJORIE ODEN, Eastern Editor

THE SOVIET EXHIBITION of Science, Technology, and Culture, which will be open until August 10 at the Coliseum in New York City, features exhibits of Russian nuclear and engineering progress more encompassing than those shown the world's top scientists in Geneva.

Yet, according to the *New York Times*, the Russians lost no time in outfitting all the men and women employed as guides in American suits, dresses, and shoes. And the exhibit of a "typical" furnished apartment in Moscow aroused so much skeptical comment that it soon was blocked off and now can be viewed only from afar.

CONSULTING ENGINEER borrowed Dr. S. Baron, who attended the Second International Conference on Peaceful Uses of Atomic Energy in Geneva, from Burns and Roe, Inc., where he is chief nuclear engineer, to make a comparison of Russia's relative stand in nuclear development, and to compare the exhibits shown with what the USSR had released at previous shows.

Improvement Over Geneva Exhibit

Circling through to get a general impression of the technical exhibits, Dr. Baron noted with some surprise that the American public is being exposed to more technical exhibits and audio-visual demonstrations than the Russians put forth in Geneva. Of course, the USSR was at somewhat of a disadvantage at the Swiss show. Shortly before the Geneva exhibit opened, the United States declassified a large amount of information on nuclear development. The Russians obviously were caught with their exhibits down and were able to add only a few charts and graphs.

Dr. Baron theorized that the Russians also might have picked up a few hints on showmanship from the U. S. in Geneva. Obviously expense was not much of an object in the New York presentations.

"The United States' scientific exhibit at Geneva was, I am sure, the splashiest, costliest, and most educational technical presentation ever assembled under one roof," Dr. Baron recalled. "The U. S. has been criticized for supposed commercialism in its nuclear effort and an interest in the field motivated primarily by monetary rather than humane aspirations. With this criticism apparently in mind, the American exhibit, while elaborate, minimized any obvious commercialism and emphasized the achievements in the basic sciences."

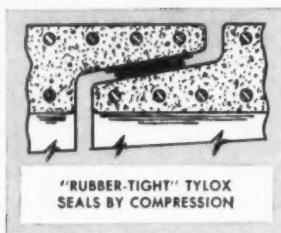
According to Dr. Baron, the U.S. exhibit at Geneva also avoided the "cliche" criticisms of Americans abroad. Guides were provided who spoke English, French, and German. Top scientists were available to answer questions.

The Russians, by contrast, had only signs and charts illustrating most of their developments. Since these were shown only in Russian and no one was provided who could translate, the language barrier appeared more formidable than the classification of information.

The Soviets evidently learned from their mistake. The second floor of the Coliseum, which is the scientific and featured area, was crowded with scale models. Earphones were provided to give nutshell progress reports. Maps, with lights showed comparisons of 1913 and 1958 in the USSR.

Guides, some who spoke English and others who had friends around who could translate, were well distributed throughout the room. They seemed

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willing to answer basic questions, but tended to disappear when it became apparent that Dr. Baron was not a typical member of the public when it came to knowledge of nuclear matters.

Plasma Research Highlights Exhibit

Highlight of the technical show is the exhibit showing Soviet progress in plasma research. Dr. Baron said infinitely more information has been provided than he had ever seen before.

Dr. Baron explained the problems in this field:

"Briefly, all experiments on controlling fusion are based on containing highly ionized deuterium and tritium gas, called plasma, for sufficiently long times (about 1 sec) at temperatures of 50-100 million degrees. This is necessary in order to overcome the repelling force of the ions and permit them to fuse. This requires a stable discharge within a container. Since a magnetic field can control charged particles, it is the method currently being used to contain the highly ionized plasma."

"However, since individual particles in the plasma may collide with each other, recoil, and leave the magnetic field, a magnetic field is not a perfect wall. In addition, the charged particles act together to produce additional magnetic and electric fields which push the plasma across the confining magnetic field. This instability is one of the major problems. Since the plasma travels in a tight helical circle perpendicular to the magnetic field, it moves along the field direction and, experiencing no restrictions at the ends, leaks out."

The Russian exhibit includes a model of OGRA, an experiment designed on the same principles as the DCX at Oak Ridge. These are based on trapping high-energy ion beams inside a magnetic mirror. The beam results from the injection of molecular deuterium, decomposed in an electric arc to neutral deuterium, which escapes, and a positive charged deuterium nucleus, which is trapped in the magnetic field. The fusion reactors aim at developing several hundred megawatts per cubic meter, so that they will be comparable in size to fission reactors.

Dr. Baron, continuing around the exhibit, explained that in 1955, all the major countries favored a different reactor type — the United States the PWR, Britain and France the gas-cooled, Russia the water-cooled graphite moderated, and Canada the heavy water.

"Now a certain orderliness is beginning to emerge and the American program is indeed leading the world in creativeness. Countries like Britain and France, where conventional power costs are high and alternate fuels necessary, have concentrated on the gas-cooled graphite moderated reactors. But even these countries are evaluating



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homogeneous reactors, enriched high-temperature gas-cooled reactors. Britain is building a fast reactor and purchasing a PWR for propulsion, while France, by virtue of her participation in Euratom, is falling heir to the water-moderated and cooled technology from the United States. Following Canada's lead, every country now is considering heavy-water power reactors while the gas-cooled heavy-water moderated concept is being especially supported by many European countries."

Circling the Soviet show, one can see exhibits featuring PWR, BWR, graphite moderated with water-cooled nuclear superheat, homogeneous aqueous, sodium graphite, sodium-cooled fast reactor, and mobile PWR power plants.

Research Patterns Parallel U.S.

Dr. Baron frequently commented—"This is similar to work at Oak Ridge," or "We are working on this at Argonne," or "This looks like Idaho Fall's work."

Spies? "No," Dr. Baron explained. "Russia and the United States both have an abundance of fossil fuels. For this reason, what is practical for one will also serve the other well. And there is another reason for the similarities. When the Russians learn, through scientific shows or literature, that we are working on something, they investigate it. And we do the same. For instance, I have done some research at Burns and Roe along the lines of the Soviet's uranium hexafluoride experiments."

Russian Nuclear Leadership

When he came to the ice-breaker Lenin, Dr. Baron commented that the Russians are ahead of us in nuclear-powered surface vessels.

The Lenin, which displaces only 16,000 tons, has an atomic power unit of 44,000 hp. It has three PWR reactors in thick-walled casings installed in a central compartment. One of the reactors is on stand-by. Dr. Baron said the Lenin is capable of moving through more than six-ft thick ice fields at a speed of 2 knots, and at 18 knots in ice-free water. The four main 11,000-hp turbogenerators produce direct current for the motors which drive the three propeller shafts.

By contrast, the United States N. S. Savannah, which will be put into service about one year after the Lenin, has a single PWR reactor with 74 Mw of heat capable of producing 22,000 hp at the shaft of a single propeller. The reactor plant not only has the usual containment, but also the section of the hull near the reactor is reinforced to sustain the impact of direct collision. It will be capable of cruising 300,000 miles without refueling with a core life of three years.

A model was shown of the Russian's first atomic power station, which commenced operation in June

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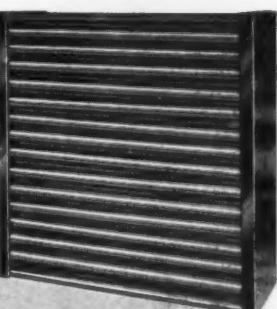
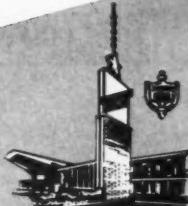
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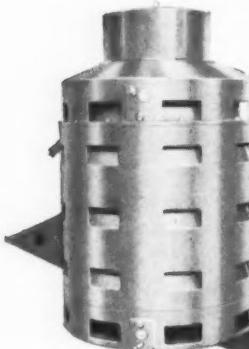
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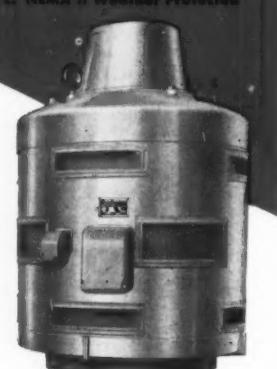
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1954, and has operated ever since without major failure. This is a pressurized-water, graphite moderated reactor, which produces 5000 kw of electricity. Other models represent Russia's current nuclear power program in various stages of completion, including examples of pressurized water, boiling water, molten sodium, and uranium hexafluoride reactors. In fact, most known ways of converting nuclear energy to power generation are being explored in detail by the Russians.

The Stalingrad hydropower station, a 200,000-kw turbine generator installation with a 1,200,000-kw thermal plant, also was featured in model.

Exhibit Emphasizes Post-Czar Progress

A large map on the board is dotted with purple and red lights showing power installations in Czarist Russia of 1913 as contrasted with today. The display is dazzling, but not very informative, since the Russians carefully selected colors that are nearly impossible to tell apart.

Figures are seldom given. Merely comparisons with the Dark Czarist Ages. As Dr. Baron pointed out, one electric light in 1913 and two now looks pretty good as an increase of 100 percent.

Munching on a hot dog, Dr. Baron pointed out that little is being done in the Soviet Union that is not or could not be done right here. "But I hope this show jolts some Americans from their complacent picture of the Russians as peasants without scientific initiative."

He added that, in his opinion, the show is well worth the time to any consulting engineer who wants to keep up with the international times.

Other Exhibits

On the day of CONSULTING ENGINEER's visit to the Russian exhibition, the Russians had a confusing cross section of the American public. One Russian stared curiously at a long-haired and bearded member of an American religious sect in a long black robe. And Lions complete with hats and badges were everywhere — and apparently quite interested.

A giant combine, in the agricultural division, invoked the comment from one observer that "the other one is in the Ukraine."

The exhibit of Soviet books, which included one which curiously resembled a Russian prayer book or Bible (but no copy of *Dr. Zhivago*) was dominated by a sign that stated "U.S. Customs regulations require that these books not be removed."

The art show concentrated on portraits, quiet landscapes, and views of happy workers eating picnic suppers as the sun sets behind the tractor.

Travel books for some time have warned visitors to Russia to bring their own sink stoppers. In the households exhibits, the sinks had no stoppers. □

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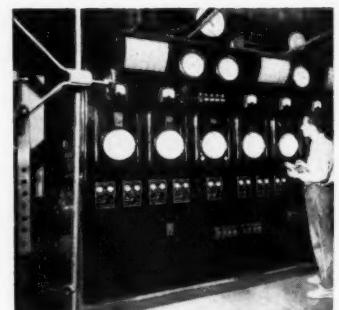
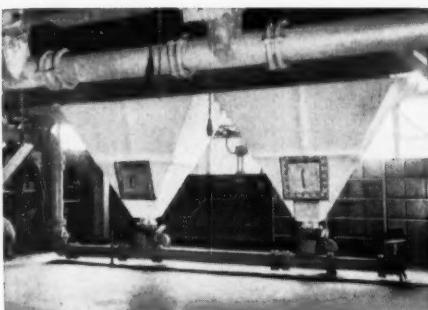
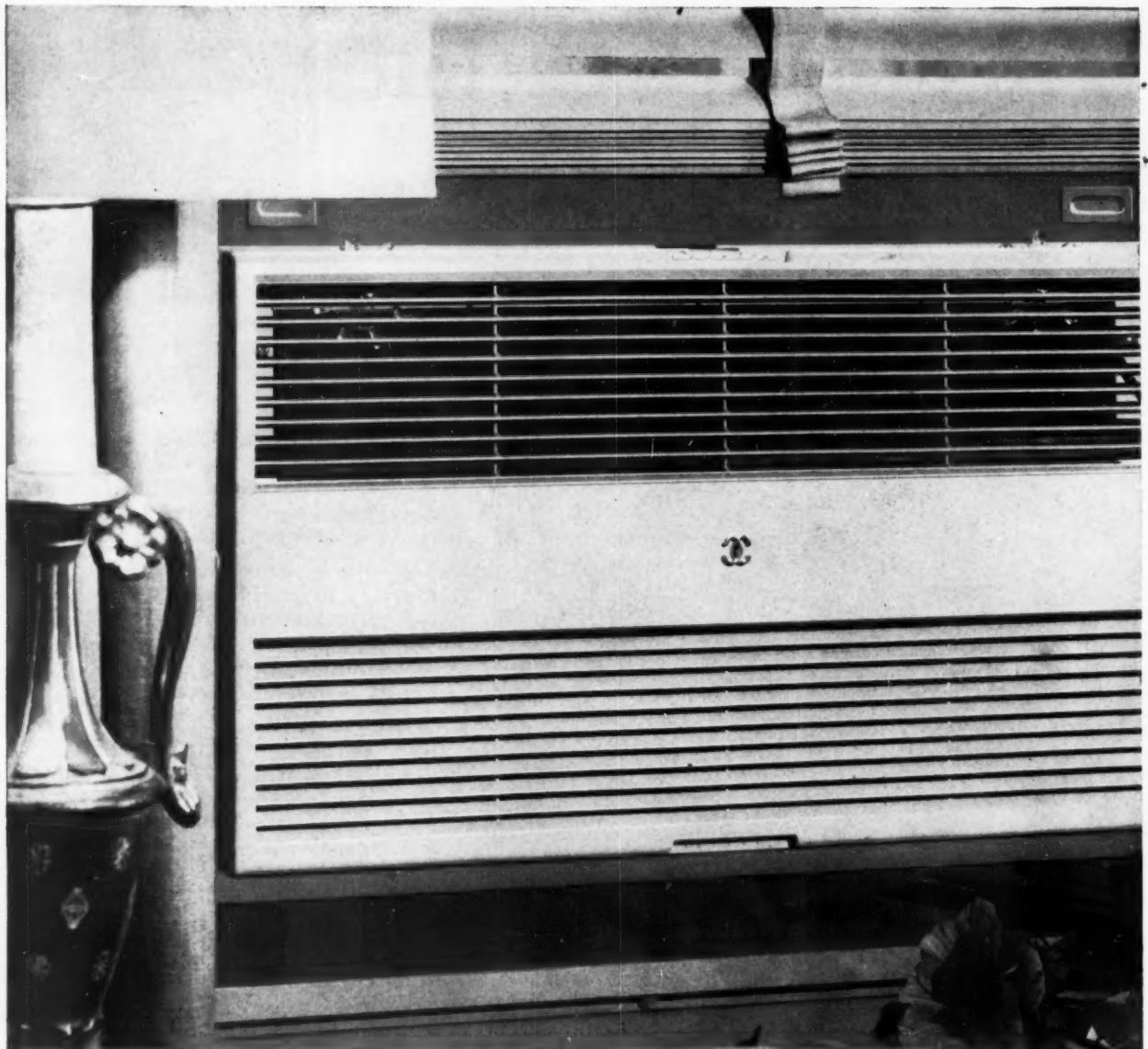
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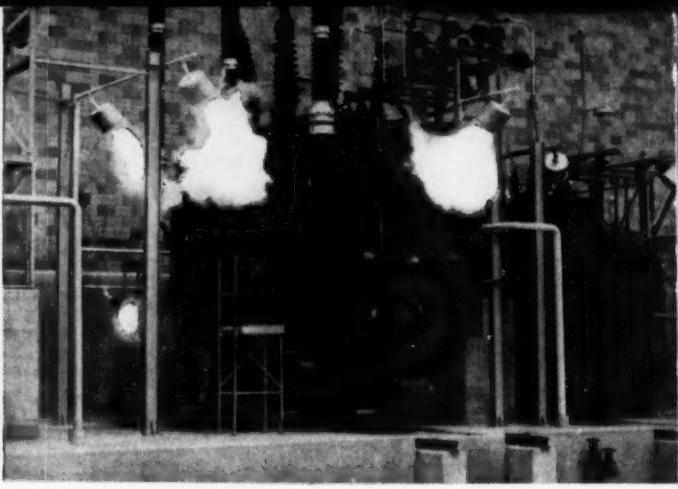
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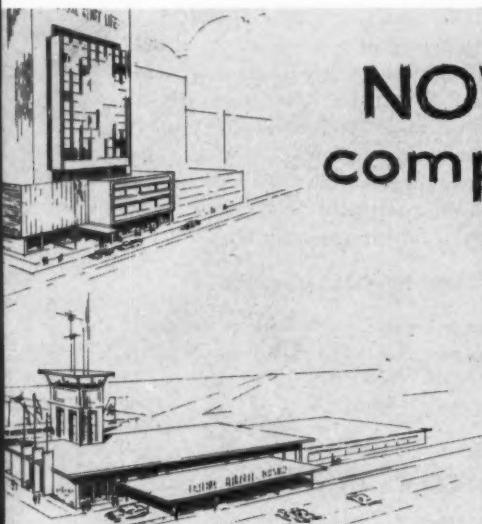
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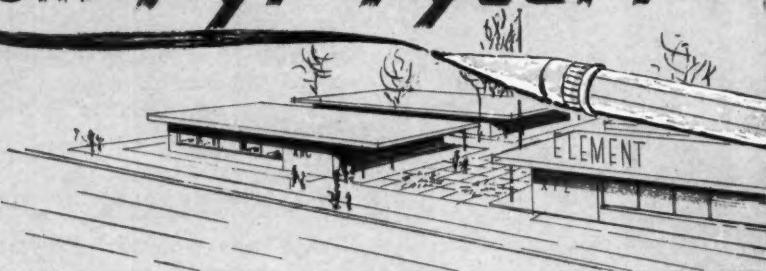


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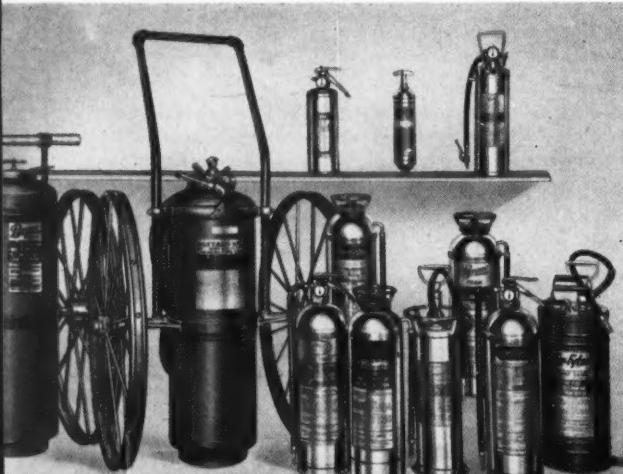


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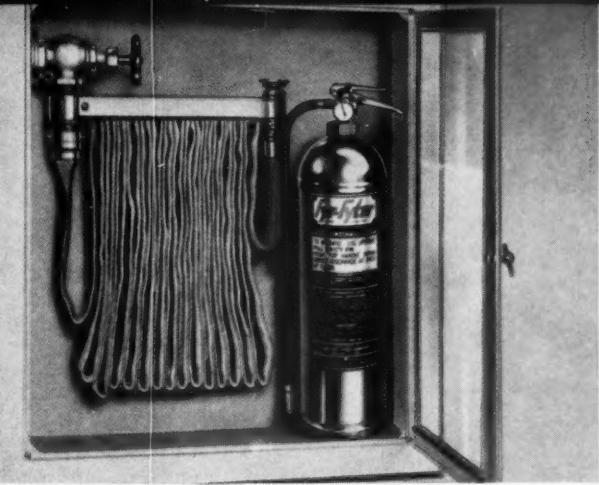
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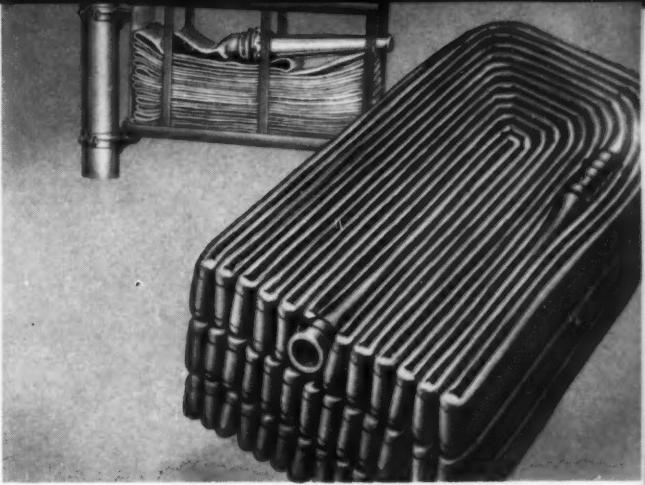
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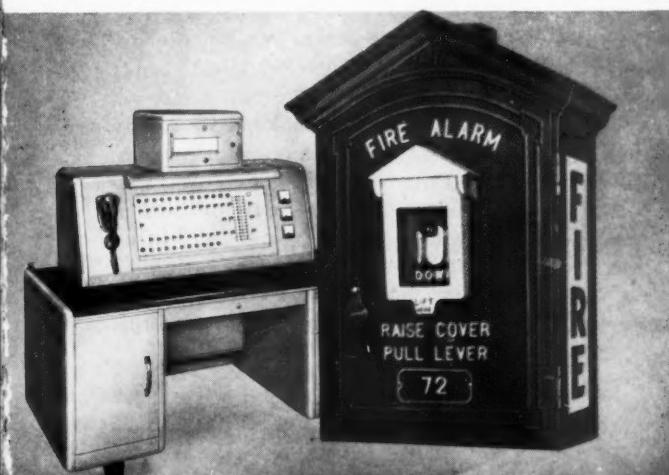
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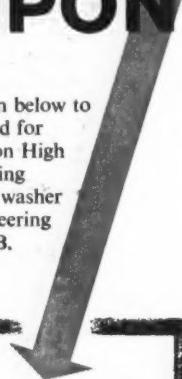
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Field Notes

MARJORIE ODEN

Eastern Editor



ABOUT 2000 ENGINEERS gathered in New York City recently for the 25th Anniversary Meeting of the National Society of Professional Engineers. For those who were not busy enough attending NSPE meetings, conventions of the New York State Society of Professional Engineers and the New York Association of Consulting Engineers were held simultaneously. The commuting between the convention hotels was of necessity heavy.

Highlights of the NSPE Silver Anniversary meeting included:
 ¶ NSPE's reaffirmed decision not to join Engineers Joint Council.
 ¶ A plan for certifying engineering technicians, modeled on that used in Ontario. This is to receive further study.
 ¶ Refusal to recommend that NSPE amend its current policy in order to encourage more extensive use of consulting engineers in highway design, by two NSPE functional sections, including the section for engineers in private practice.

Repeat "No" to EJC

In 1953, NSPE received a formal invitation to join EJC. After much deliberation, the invitation was declined on a basis that "... no organization can adequately represent the engineers of this Nation unless that organization is based primarily upon individual membership and constituted to assure prompt and effective means of communication between the individuals, their local or state units, and their national governing body."

At the recent meeting, it was announced that "the committee has restudied the previous Board action and, in view of developments since, can find no reason to now change the logic expressed and actions taken heretofore. In fact, this logic has stood the test of time and would seem to be even better established today than in 1953."

Actually, the discussions were a little more "logical" from one standpoint in 1953. At that time, NSPE had a formal, written invitation to join EJC. And as EJC tactfully expressed it, "of course the door always has been open for discussion as to NSPE or any other interested group joining EJC." But no formal invitation has been issued for the past six years.

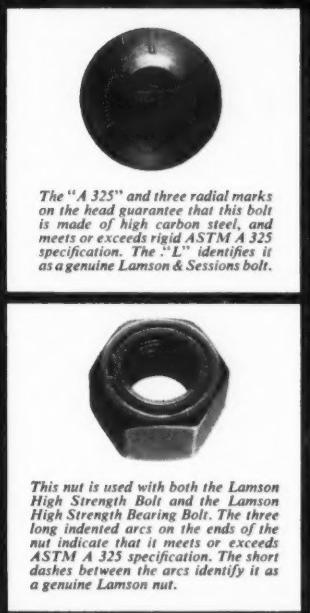
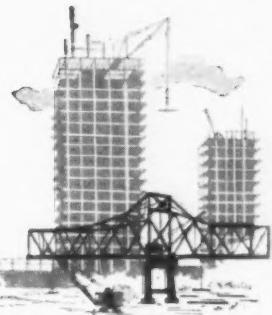
Some quite candid opinions were exchanged by the two major engineering societies during the current "negotiations."

Enoch Needles, EJC president, was invited to meet with NSPE earlier this year, but was unable to attend the meeting. According to Needles' letter:

"Last year I had the idea that all of us had open minds and that the entire subject was open for review without commitment, and I was then very desirous of meeting with this committee (Intersociety Relations) for informal discussions. At the NSPE meeting in San Francisco, this committee adopted a number of guiding principles which appeared to change the picture so completely that any presentations on my part would appear futile."



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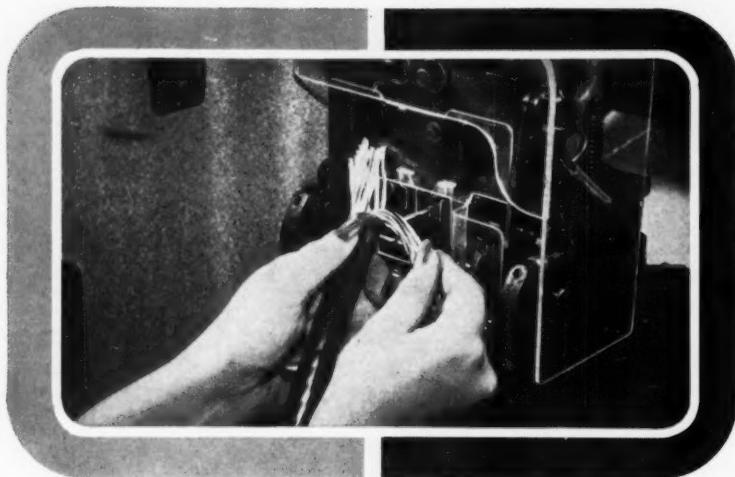
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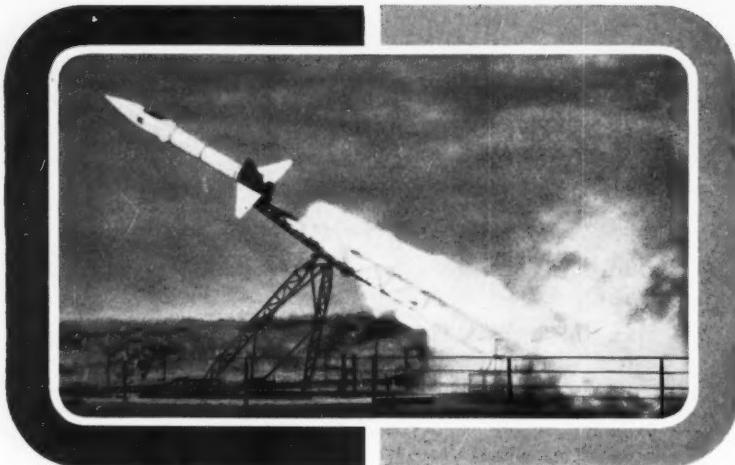
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These decisions included the adoption of the so-called 'Functional Plan' by NSPE, together with other statements which practically closed the door so far as any individual was concerned.

"With specific regard to the 'Functional Plan,' the approval of this plan by NSPE follows the previous approval by AIEE (American Institute of Electrical Engineers), and I must point out that no other society to my knowledge has followed with such approval.

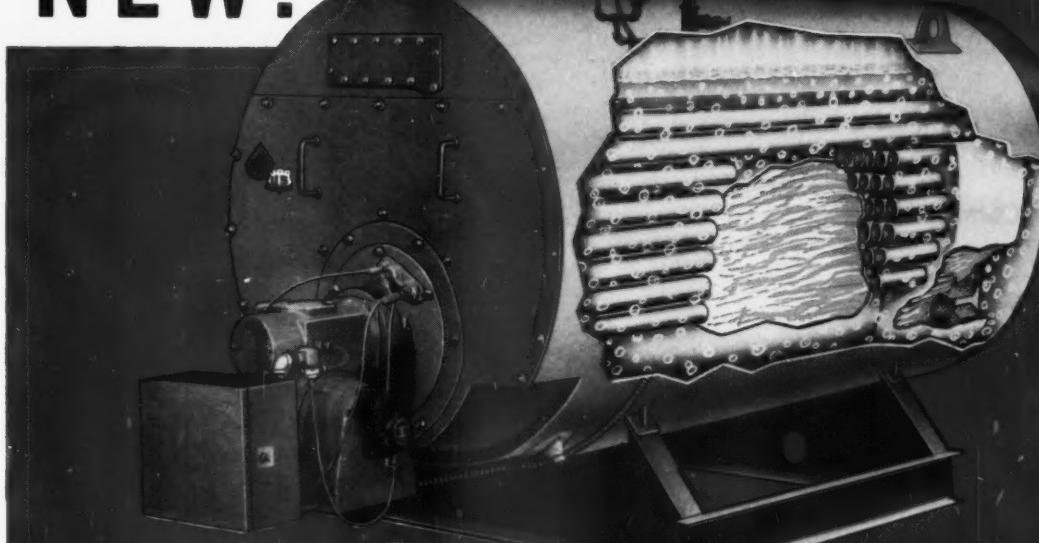
"The most important anomaly with regard to the 'Functional Plan' is that EJC, ECPD (Engineers Council for Professional Development), and NSPE are put on an apparent parity for operational purposes. To me, this constitutes an impossible proposal . . .

"The elevation of NSPE to a position of parity with EJC and ECPD is not a very logical proposal if only because of the fact that there are probably very few who would be willing to agree that NSPE has now reached a status which is superior to the other major societies of our nation or has reached a position of parity with all of them combined.

"Based on all that has happened heretofore and all that I have heard discussed about the future, we could be sure that if NSPE should join as a constituent member, it would receive the logical assignments of activities which are in keeping with the past and present programs of NSPE. There would be no conflict with other societies, nor would there be any desire or effort on the part of any of the organizations in EJC to take anything away from NSPE."

Why does NSPE not wish to join EJC? According to the statement prepared by the committee: "(1) Seven of the 10 objectives of EJC specifically mention 'the art and science of engineering' and all 10 definitely and exclusively concern the technical phases of the profession as stated by the phrase 'the art and science of engineer-

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B-Boiler Width.....	In. 41½	45½	45½	51½	51½
Overall Height.....	In. 58½	60½	60½	68½	68½
C-Height to Top of Nozzle.....	In. 54	58	58	64½	64½
Shell Diameter, Inside.....	In. 38	42	42	48	48
Base Width.....	In. 41½	45½	45½	51½	51½
Base to Burner Front.....	In. 74½	76½	94½	85	97½
Roof Overhang.....	In. 16	16	16	20	20
Supply Outlet Location.....	In. 49	49	49	52	52
Return Location.....	In. 7	7	7	7	7
Watertube Height.....	In. 44	47½	47½	52½	52½
Smokeshed C.L. Location.....	In. 42½	45½	45½	51½	51½
Smoke Outlet Diameter.....	In. 8	12	12	14	14
Clearance for Drawing Tubes.....	In. 50	53	70	66	80
Supply Outlet Size.....	In. 6	6	6	6	6
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ing.' None of the 10 objectives make any reference whatsoever to what is normally termed the 'professional matters' of concern to the profession. It will also be noted that the objectives of NSPE concern only 'the professional, social and economic interest of the professional engineer.' NSPE has very carefully refrained from entering into any of the fields of 'the art and science of engineering.' This raises a most serious question as to the propriety of NSPE being a constituent society of EJC.

"(2) Another question concerning the inappropriateness of NSPE affiliating with EJC is raised by EJC's stated purpose that 'no substantial part of the activities of the corporation (EJC) shall be the carrying on of propaganda or otherwise attempting to influence legislation.'

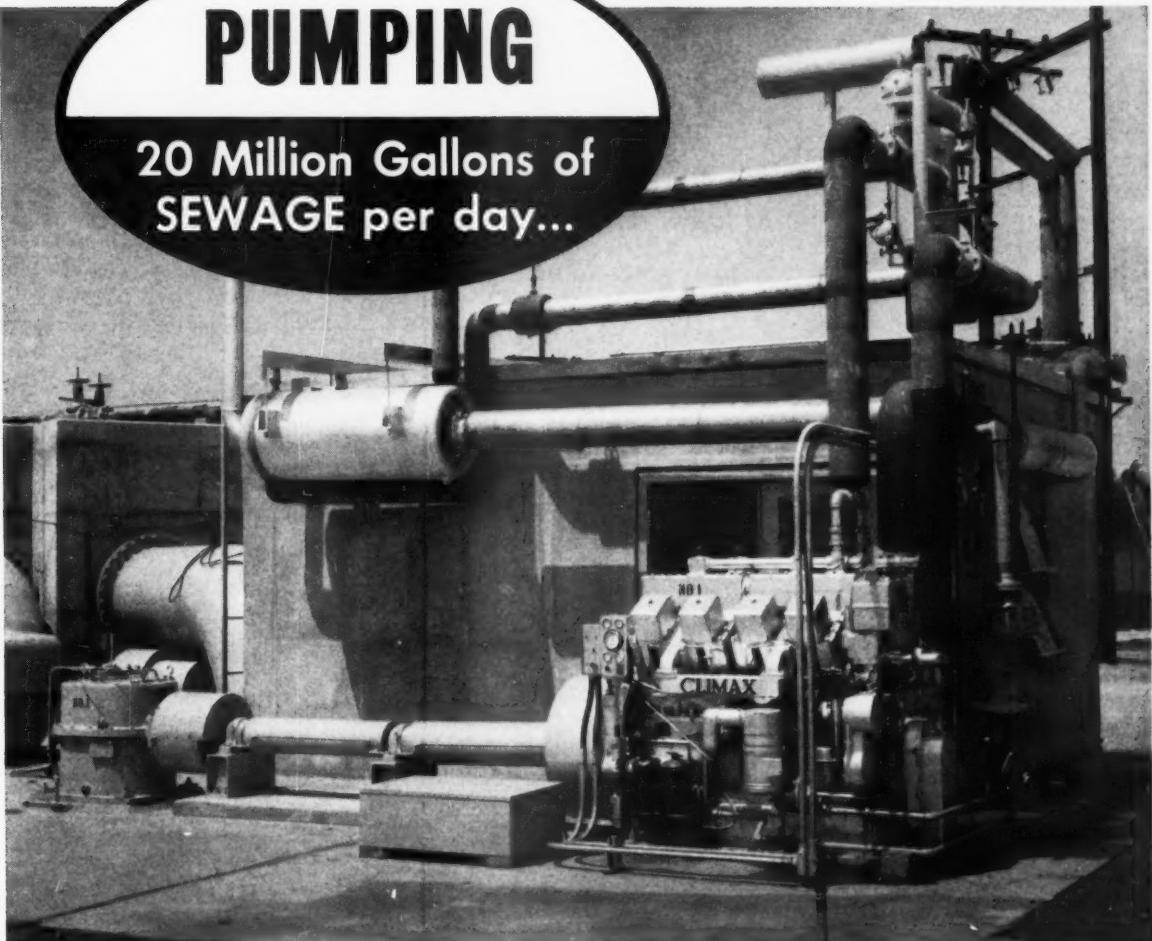
An important activity of NSPE is concerned with legislation affecting the engineering profession and, therefore, such activity would be contrary to the objectives of EJC.

"(3) A question might well be raised as to whether or not, under the stated objectives of both organizations, NSPE could properly pay dues into EJC. A large percentage of NSPE's members are now represented in and pay dues to EJC through their technical societies, and should NSPE also affiliate with EJC, this would mean that NSPE members would actually be paying dues to EJC through both their technical societies and their professional societies. Many NSPE members could well question the fairness of their being assessed such a duplication of payments into one organization."

The Committee added "... That the weaknesses of EJC are those inherent to a federation of societies; that the affiliation of NSPE with EJC would only add a few dollars to woefully inadequate financial coffers and could in no way give additional finances to the constituent societies of EJC so that they could afford to appropriate more money to it; that the weak fi-

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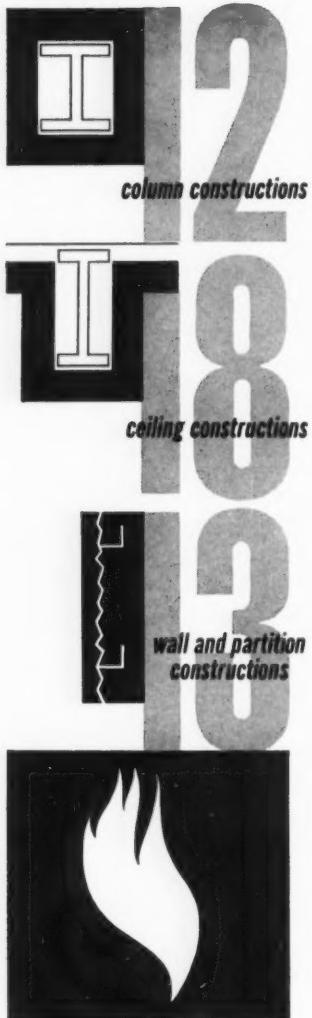
engines are automatically switched over to butane fuel. They operate with vapor phase cooling, and the waste heat is used in the digesters. The Climax V-8, unusually compact in design, packs more power into less space. Rugged, too, for durability with dependability in continuous duty sewage plant service. Its famous fuel economy is built-in. For all its plus-value features in detail, get Bulletin SA-584.

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nancial foundation of a federation of societies was demonstrated in the failure of the American Engineering Council several years ago; that the affiliation of NSPE could in no way solve the tax status problem of EJC, nor could it affect the remoteness of EJC from the individual grass-roots engineer — except possibly as NSPE might publicize EJC to its own members through its own organization or its directors."

So all in all, it looks bleak on the unity front.

Certification for Technicians?

For some time, NSPE has been toying with the idea of certification for technicians. Should technicians be registered in some manner? Should they be allowed to join NSPE?

This year, NSPE met with Col. T. M. Medland, executive director of the Association of Professional Engineers of the Province of Ontario, to learn how the Canadians have handled a similar problem. The method sounded good, and it is to be given further study.

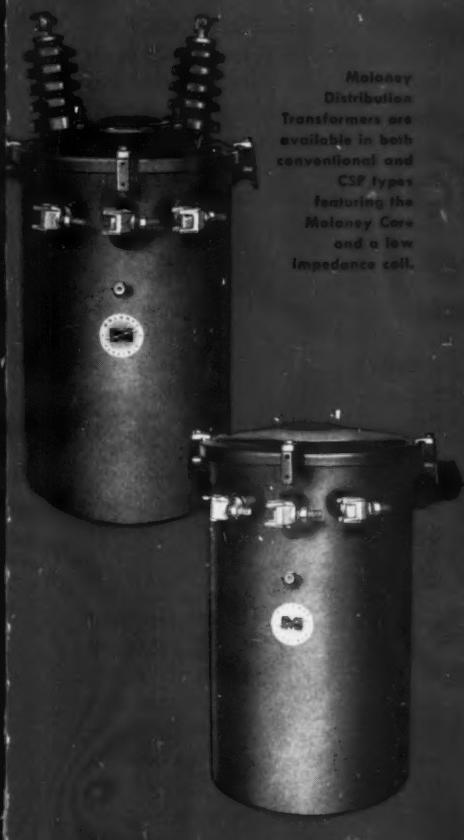
Based on recent studies, the Committee on Engineering Technicians recommended that NSPE should make no attempt to foster registration for technicians or to accept them as NSPE members.

"After further study and particularly after receipt of information from Col. Medland on the Ontario procedure, the Committee now believes that the certification procedure can and should be developed primarily on the basis of educational certificates from established educational institutions together with experience requirements to be set forth in the future by this Committee as approved by the NSPE Board of Directors.

This committee believes that there is no real justification for the legal registration of engineering technicians. There were, in Ontario, efforts towards legislation for registration of engineering technicians. While this committee does

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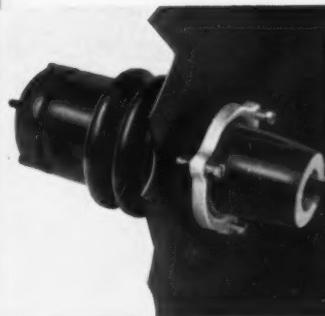
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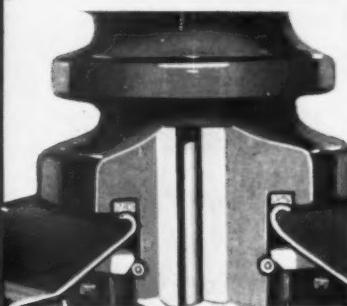
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All bushings are made of high strength, wet-process, porcelain and are internally clamped using one piece Almag clamps. The high voltage bushings have a configuration design to obtain liberal creepage without excessive height and to assure high impact strength. Each gasket is made of reusable cork-neoprene and is retained.



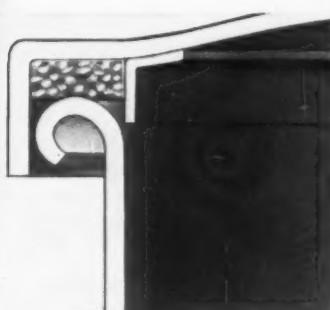
Sidewall bushings have the hardware keyed to the porcelain and the porcelain keyed to the tankwall, thereby preventing rotation of the bushing or any of its parts. Sidewall mounted high voltage bushings are equipped with a special cap for clamping the conductor in place quickly and safely without the use of tools.



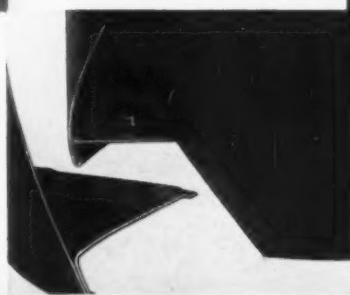
Cover mounted bushings are mounted on a smooth flange raised above the cover. This smooth rounded flange and the shape of the porcelain positively prevents the entrance of moisture. The contour of the flange eliminates corona at this point. Protective caps are provided for all cover mounted high voltage bushings.



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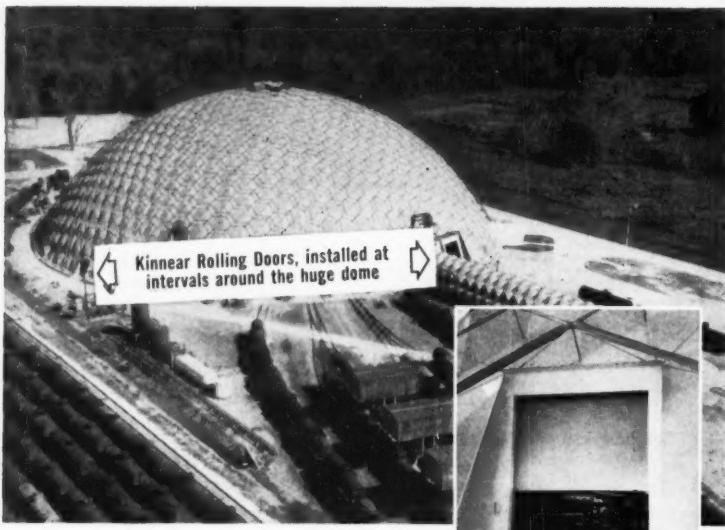


The tank and cover are die-formed assuring consistently accurate fit. The cover overhangs the tankwall and is dome shaped to shed moisture. The combination of a rolled top rim, cover overhang, cork-neoprene gasket and the gasket retainer positively seals the tank from moisture.



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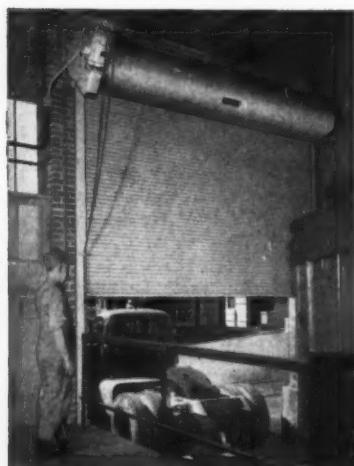
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not at this moment know of any such efforts in this country, it believes it is logical to assume that this may very well come about in the near future. This then is another of the reasons why the Committee believes the certification procedure should be developed. It will give the engineering technician status without going through a legal registration procedure."

It also will give him status without going into a union, but this was not mentioned.

"No" to Highway Consultants

The Washington State Society petitioned the NSPE to "prevail upon the Bureau of Public Roads and the various state highway departments to adopt a policy of using more consulting engineering firms to alleviate the bottleneck in their own organizations due to the current accelerated highway program."

This was referred to the Engineers-in-Government Subcommittee of the Employment Practices Committee and to the Functional Section for Engineers in Private Practice for recommendations. The government engineers like the status quo, which is not surprising. So does the Functional Section, which is surprising.

Balance Preferred

The Engineers-in-Government had pointed out that, "NSPE policy, as now in effect, seeks to recognize the importance and role of both elements of the profession in the highway program — that of the consultant for peak demand, and of the state highway department organizations for regular and continued engineering services . . . The balance between the allocation of engineering work to consultants and the state highway departments can best be handled at the state level, depending upon the many complicated and varied factors which must be considered in arriving at this decision."

The Functional Section for Engineers in Private Practice agreed,

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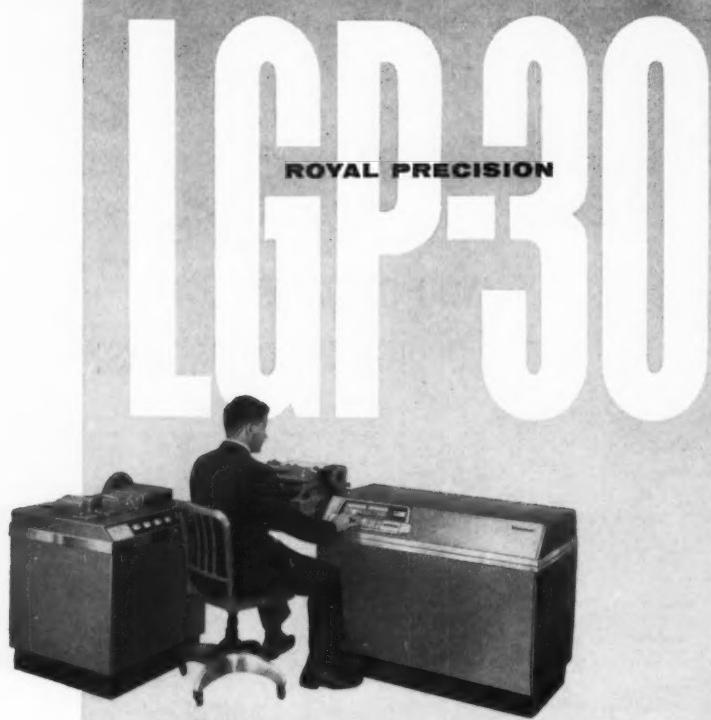
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The large capacity LGP-30 has a memory of 4096 words and is by far the easiest computer to program. Answers are printed out directly — require no deciphering. Self-cooled, the LGP-30 simply plugs into any convenient wall outlet... can be operated with only minimum computer experience. Auxiliary high-speed input-output equipment is available for system expansion.

No expensive installation or air-conditioning required. Customer training is free. An extensive library of programs and sub-routines is available—as well as membership in an active users organization. Sales and service facilities maintained coast-to-coast. For further information and specifications, write Royal McBee Corporation, Data Processing Division, Port Chester, N. Y. In Canada: The McBee Company, Ltd., 179 Bartley Drive, Toronto 16.

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stating that, "Although we are in general accord with the intent of the resolution which we construe to be a desire to achieve a proper balance between the use of consulting engineers and state highway department engineers for the highway program, we do not favor its adoption or approval by the Board. The information at hand indicates some difference of opinion regarding this situation, and it is not at all clear that this is a matter which can be resolved at the national level. Rather, it seems that the problem is one of state jurisdiction because in some states the highway program is handled to a large extent through the use of consulting engineers, while in other states the policy seems to be opposed to the use of consulting engineers. The Bureau of Public Roads advises that the use of consulting engineers in the program is to be determined by the state, and this policy is in accord with NSPE Policy No. 54."

Worried About Criticism

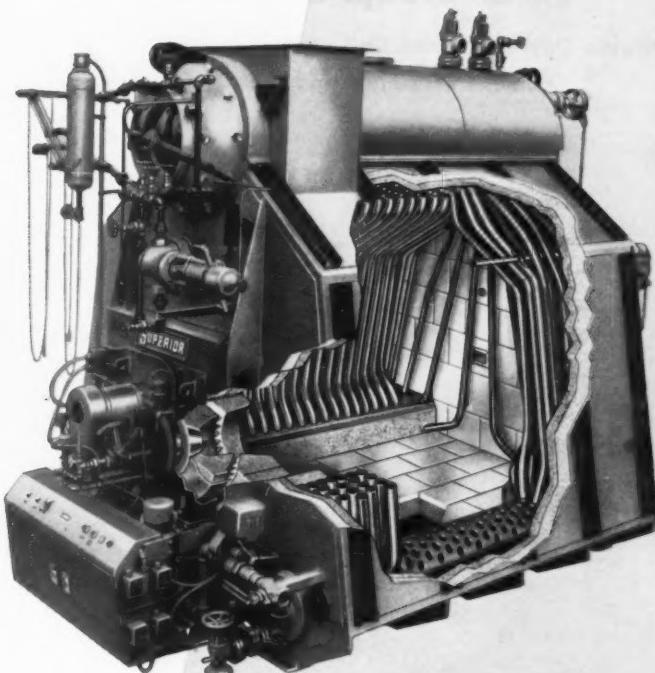
However, the Functional Section for Engineers in Private Practice is concerned with recent trends in Congressional committee reports discussing the use of consulting engineers — and with good reason. Two appropriations committees — for Public Works and for the Interior Department — questioned the future use of consultants.

According to the Functional Section statement, "these criticisms show an obvious lack of information, or even a viewpoint based on misinformation, which must be corrected. One committee, for example, states that fees for engineering services have been 'excessive' and another apparently believes that it is always more economical for a government agency to do its own engineering. This concept completely ignores the Hoover Commission Task Force report of several years ago which found that the costs for government agency engineering are often far above those for work performed by

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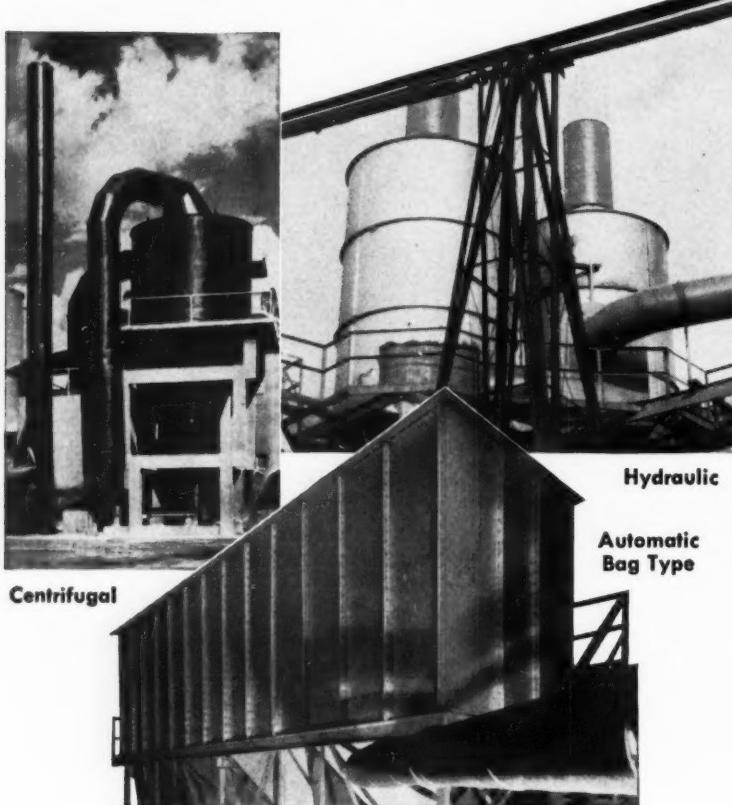
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private consulting engineering firms.

"The Functional Section has undertaken a complete review of this recent criticism and plans to prepare a well-documented statement for submission to the appropriate Congressional committees and others during the various hearings and investigations which are expected to result from the Congressional comments."

On Ethics

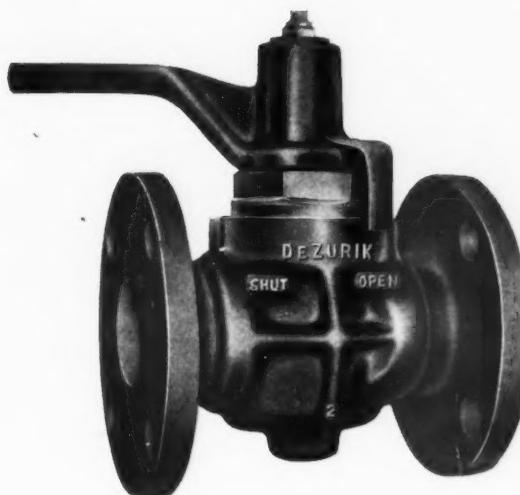
The Board of Ethical Review has found a group of engineers, formerly employed by a Federal agency, to be "in violation of the spirit" of the Canons of Ethics. Assigned by the agency to work on the basic planning for a foreign engineering project, they later resigned from the agency, formed their own consulting firm, and successfully negotiated an engineering contract with the foreign owner for the project on which they had previously worked as employees of the Federal agency. The opinions of the Board deal only with the principle of factual situations, rather than specific "trial" for violation of the Canons — normally a function of state societies or local chapters.

In explaining its stand, the Board said "it makes little difference in the basic ethics of the problem whether a man leaves the employ of the government to open his own consulting office or whether he goes to work on a salary for a consulting engineer; it tends to bring dishonor to the profession of engineering if the man devotes his energies, while still employed, to promoting his future practice or employment on the basis of having inside information which would lead to greater profits, if he can secure a position or enter into contract to work on further details of the identical project."

Of course, unless a state society or an engineering registration board now chooses to take action, this is the end of the matter. The names of the offenders will not be made public, even though they

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and others.**

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have been termed "in violation of the spirit."

The Ethical Practices Committee also was asked for an opinion by a Federal agency planning to establish a policy. The committee declared it is permissible for a consulting engineer to work concurrently or subsequently for both a public agency and a redeveloper in connection with the same urban renewal projects, subject to ethical and legal limitations regarding conflicts of interests.

AEC Asks for Bids

The Washington State Society presented a resolution stating that the Atomic Energy Commission asked for competitive bids at Hanford for design and construction projects, and "it is understood to be a policy established by the AEC, Washington, D.C."

As the Washington Society pointed out, the AEC policy makes it necessary to do preliminary design work before bids can be submitted by the contractors. This means the contractors are retaining consulting engineers, and of the consultants who do such work, only the one working for the winning contractor will get paid. "In order to warrant taking this gamble engineers will be forced to increase their fees," the resolution explained.

The Society requested NSPE to contact AEC and explain that current AEC policies not only result in unethical practice but also increase project costs at the taxpayers expense.

No statement was issued on this matter by NSPE at the meeting. The resolution still is under study.

AFL-CIO to Encroach?

The Engineers-in-Industry Committee predicts that the AFL-CIO may get into an NSPE field — professionalism.

The AFL-CIO has formed a Special Working Committee on the Problems of Technical and Professional Workers. A recent letter sent to unions with a special interest in

HOW



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*Heat measurement study under way at ETL
for joint CBM-RLM-NEMA committee . . .
aims to improve fixture and ballast heating conditions
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This maze of wires above is needed to connect with thermocouples in fixtures, ballasts and other parts, so temperatures can be measured at different points. Screening shields break up drafts from air conditioning, help keep ambient constant.

NEW streamlined fluorescent fixtures, new high output lamps and space-saving mounting trends have often brought higher channel ambient temperatures . . . and problems to user and installer!

To deal with them, Certified Ballast Manufacturers led in setting up a joint technical committee with RLM and NEMA fixture makers. For this group, ETL is measuring temperature at 50 different points in representative fixtures, to try to pinpoint the part each of the lighted fixture components plays in the total temperature rise. Already progress has been made . . . and more is expected.

But this is just one contribution by CBM toward better ballast value. Behind it all is the CBM specification which assures quality performance, including:

Long lamp life • High power factor • Positive starting • Lasting service • Peak lighting performance

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4-53

organizing engineers and scientists explained that professional and technical workers "want a kind of professional identification and service which frequently outruns the capacity of a single union to provide. Thus, there is the need to take positions on questions of education as they affect scientists and engineers; the need to define professional standards and to deal with the full utilization of the skills of professional workers . . ."

The committee concluded that "If this means what it says, we must expect the entry of the AFL-CIO unions into professional activities which have heretofore been recognized as the sole responsibility of the professional societies."

Other Problems

The scope of NSPE meetings is evident from the varied discussions: *Sounding Boards* — At Minneapolis-Honeywell, a sounding board

has concluded formal affiliation with NSPE. Similar affiliations are being studied at three General Electric plants. "In our opinion, the sounding board concept is likely to spread very rapidly and we urge all state and chapter officials to become familiar with the concept, background, and operation of such groups," said the Engineers-in-Industry Subcommittee, Employment Practices Committee.

National Directory — David Sykes, of Stamford, Connecticut, has asked the cooperation of NSPE in putting out a "National Directory of Engineers and Engineering Firms." He has stated that whether or not NSPE gives formal approval, the profits go to NSPE. The Functional Section of Engineers in Private Practice, asked to consider the matter, "does not recommend the proposal, in its present form, be endorsed by NSPE." However, it is to be given further thought.

American Thrift Assembly — The Functional Section for Engineers in Private Practice was asked to give future consideration to what happens to the American Thrift Assembly if and when the Keogh-Simpson self-retirement bill passes. Would NSPE like to cooperate with the representatives of other professions on future legislative matters?

Membership Status — Currently, state societies must have at least 75 percent of the voting membership composed of registered engineers. In line with unity discussions, some thought was given to possible relaxation of the rules on a limited basis for the time being. However, it was decided to leave things as is.

Surveyors — Again, the executive committee was requested to discuss the possibility of surveyors being granted membership in NSPE. It was discussed, as it has been a number of times previously, but no action was taken.

Next Meeting — The Penn Sheraton Hotel, Pittsburgh, Pennsylvania, will be the site of the fall meeting to be held Oct. 15-17. 



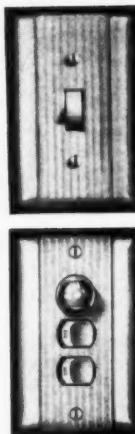
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A population growth from 1,500 in 1952 to 4,500 in 1957, needless to say, placed a substantial strain on the water supply system of Hitchcock, Texas, a predominantly residential community located 15 miles northwest of the City of Galveston. The existing system consisted of a part of the water system from adjacent Camp Wallace, which was purchased from the War Assets Administration and reinstalled, as well as the water system at the nearby Naval Air Station which was bought and re-activated where it stood. Of prime importance to the health, welfare and continued growth of Hitchcock was the necessity of extending the present water services.

THE SOLUTION

To the present water works system consisting of two wells, a 50,000 gallon standpipe, a 50,000 gallon elevated water tank, and a 500,000 gallon surface reservoir, the consulting engineers recommended that a 250,000 gallon elevated water tank be added on the opposite side of town. A new 250,000 gallon surface reservoir was also recommended. The pumping facilities were increased, as were the water lines, to provide the additional service required.

The new 250,000 gallon elevated water tank now helps to distribute the water pressure evenly throughout the community. This is another example of how farsighted communities are planning for the future with the help of Graver, which designed, fabricated and erected the elevated tank at Hitchcock. Painting and sterilizing were also Graver's responsibility.

When water pressure becomes your problem, look to an elevated tank by Graver for a thoroughly satisfactory and economical solution.

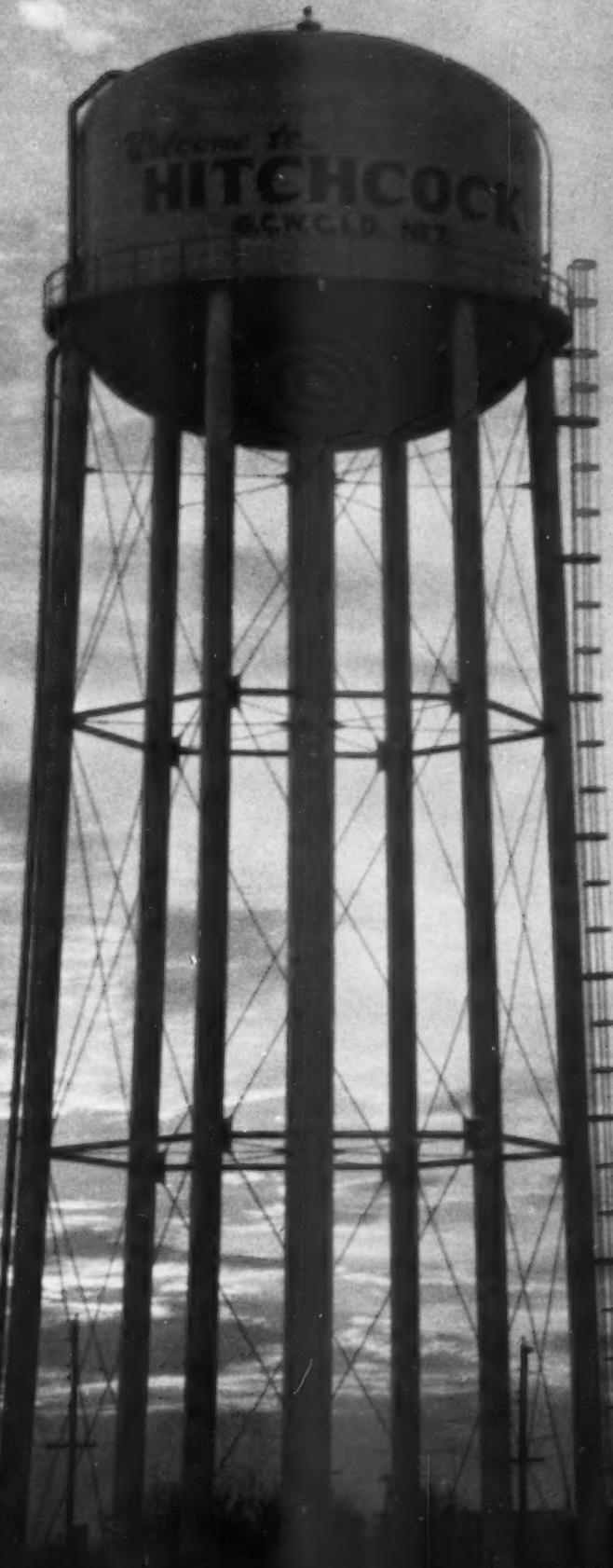
Whether your requirements are a 25,000 gallon tank or one holding 3 million gallons, you will find Graver particularly skilled in fabricating and erecting elevated water tanks to the most exacting specifications of your own engineers and your water works consultants.

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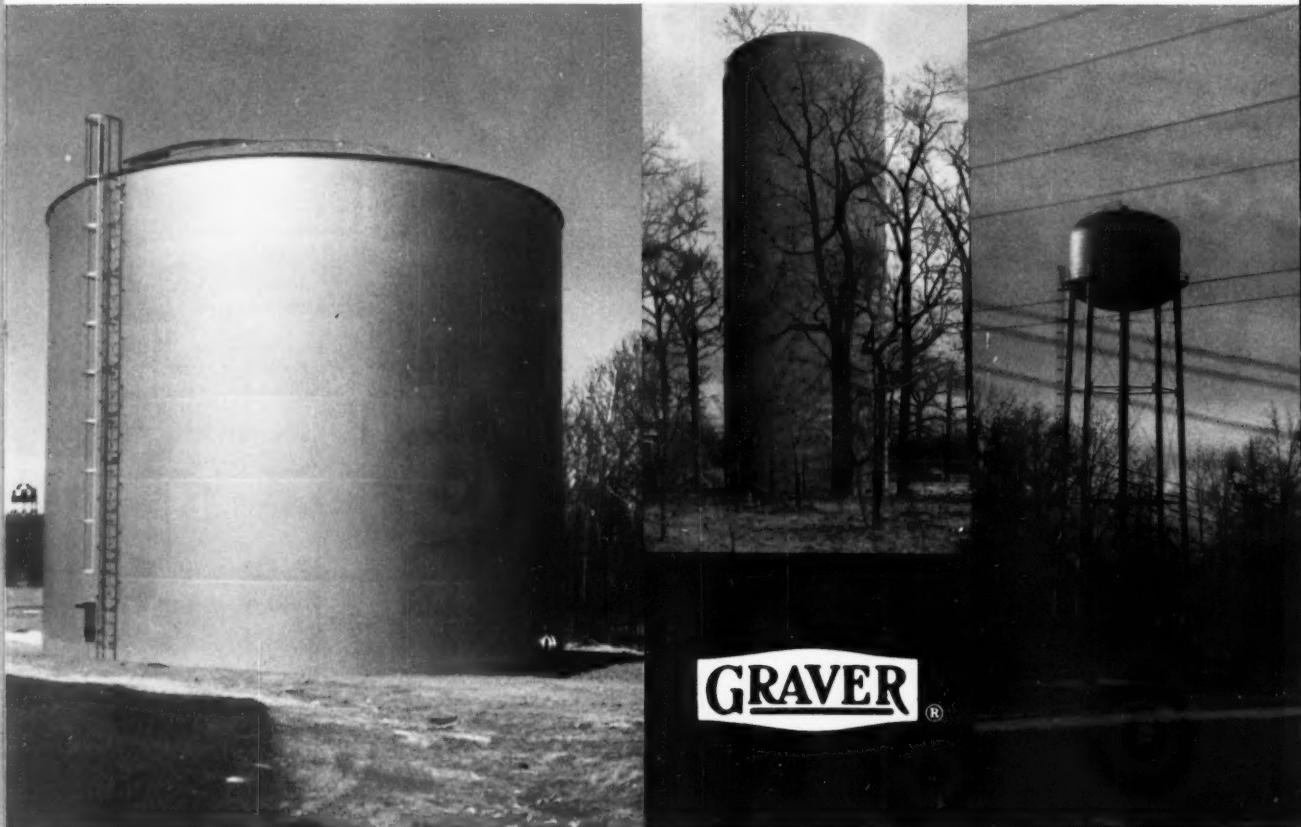


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News for the Consultant

Giant Fans on Hot Seat

Eagleson Engineers and architect John S. Bolles, both of San Francisco, have designed a radiant heating system for the San Francisco Giant's new Candlestick Park. Reserved seat fans will be warmed by more than 35,000 feet of $\frac{3}{4}$ -in. diameter wrought iron pipe. Headers for the combination grid and coil type system will be placed in the



San Francisco Giants new ballpark will have precast concrete seats warmed by radiant heating coils.

aisles, with the distribution piping spaced on 18-in. to 48-in. centers and supported immediately below the spectators' precast concrete seats.

The \$15-million park is the first major league stadium to be built entirely of reinforced concrete. There are only 26 supporting posts in the park, with each 10-in. wide support located 20 feet from the back of the stadium. Actually, no seat is behind a column.

Bosphorus Bridge Dream Realized

Design and plans for a \$50-million suspension bridge across the Bosphorus at Istanbul now are being completed by D. B. Steinman, Consulting Engineer of New York. The Turkish government announces that construction will proceed promptly upon completion of the bidding plans.

The bridge will be located about three miles northeast of the mouth of the Golden Horn and

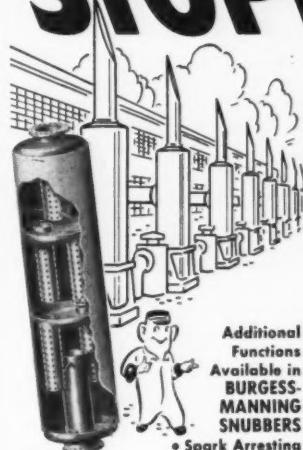


Old Istanbul, connecting the Ortakoy section of European Turkey with the Beylerbeyi section of Asiatic Turkey. The main span will be 3091 feet and two side spans will be 681 feet each. Supporting the suspension bridge are two arched steel towers rising to a height of 520 feet above water and supported on piers sunk to rock about 100 feet below water.

ICA Contract Information

The Office of Industrial Resources, International Cooperation Administration, Washington 25, D.C., has issued a form entitled "Experience Data" to

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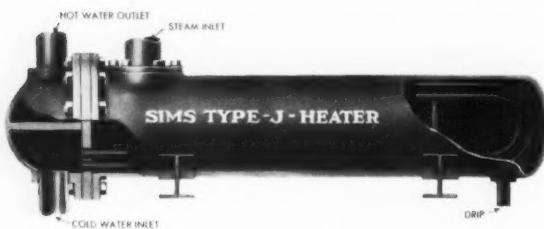


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be utilized in cataloging information on all firms and individuals who desire to obtain ICA contracts in the field of engineering. These forms are being mailed to those now registered. Others may obtain copies from the above address. The new form will facilitate review of capabilities of parties available for possible future work.

Night Lighting Is Building Feature

Bernard Johnson & Associates, consulting engineers of Houston, and MacKie & Kamrath, architects also of Houston, designed the new Dow Chemical Company administration center for Texas division operations. The low slung building is adapted to the landscape of the Texas Gulf Coast, with attractive night lighting to emphasize its low profile.

Dowell Weeks of the Johnson firm worked with A.M. Rice, past chairman of the San Jacinto Chapter of the Illuminating Engineering Society, to design an effective lighting system. Color corrected



Texas plant administration building has carefully planned night lighting to dramatize low silhouette.

mercury vapor fixtures manufactured by Wide-Lite Corporation were spaced around the building and tied in with the plant's IBM clock system so that lights are turned on and off automatically.

Underground Parking in Cincinnati

Authorization has been granted by municipal authorities for drawing up plans and specifications for an \$11-1/4 million underground garage and bus-truck loop beneath Fountain and Government Squares. A \$300,000 down payment on the plans will come from parking meter funds, with the balance of around \$600,000 from a supplemental appropriation in the fall.

The A. M. Kinney Company of Cincinnati will be prime contractor for the planning, with Charles De Leuw of Chicago, providing the design criteria. Under present financing plans, the \$6-1/3 million for the basic garage will come from revenue bonds



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paid off by income and backstopped by the parking meter fund. Cost of the bus terminal on the first underground deck and extra-wide tunnels to permit subsurface truck loading and unloading will come from general obligation bonds.

Milwaukee Water System

William Bremser of Black and Veatch has advised the city that expansion of the present water system to serve communities in Milwaukee and eastern Waukesha counties will cost \$98 million. This is \$44 million more than the city currently is spending to provide improved public water facilities to areas in Milwaukee and six suburban communities.

Washington National Airport

Consulting engineers have advised the Federal Aviation Agency that urgent projects totalling \$4.2 million should get under way to relieve congestion which is resulting in accidents, delays, and inconveniences at the National Airport. One urgent item is a 700-ft extension of the north-south runway.

School Boards Need Consultant

John Turney, an engineer and member of the new Houston school board committee of school safety, told the board that the one sure way it could guarantee school building safety was to have a full-time inspector on the job. Such a man, he said, would have to be a fully qualified engineer.

"You will get the job done right, only if you have the right man on the job," Turney said. "The whole system you are now using is wrong. You employ an architect to do the job. He in turn employs a structural engineer to draw the structural plans. However, the latter rarely sees the job after that. Therein lies the fault of bad structural work. A structural engineer is needed on the site at all, not part, but all of the time."

Turney pointed out that he knew of only one or two architectural firms in the area who had qualified men to inspect structural work. "You can place the responsibility on the architect you hire to do the work, but you as laymen don't know if you're getting good inspection or not."

Pulp Mill for Tunisia

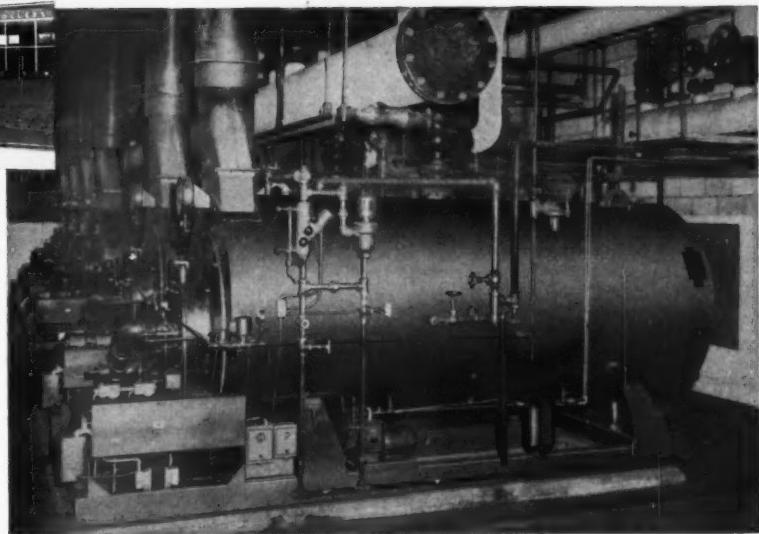
Building of the first large-scale esparto grass pulp mill in North Africa is being undertaken by Societe Nationale Tunisienne de Cellulose. Located at Kasserine, Tunisia, the \$11-million plant is being financed jointly by Tunisian, European, and North American interests, with a credit of \$6.25 million extended by the Development Loan Fund giving substantial aid to financing.

The engineering services of Stadler, Hurter International Ltd., Montreal, have been retained.

*Never more steam than you can use . . .
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One of the largest producers of graders, roadscrapers and rolling equipment, Galion Iron Works & Manufacturing Co., has six 125 HP Cyclotherms now operating, plans to add a seventh and eighth as steam demands increase. Automatic operation has been the big factor in helping Cyclotherm make the grade with the graders!



Like **GALION** Iron Works, plan for tomorrow with **CYCLOTHERM!**

With Cyclotherm Steam and Hot Water Generators, you buy steam capacity as you use it. No investment in excess capacity. No steam shortage with an outside boiler.

Cyclotherms give flexible capacity. You can add 518 lbs. of steam per hr. with a 15 HP Cyclotherm, or 25,875 lbs. per hr. with a 750 HP Cyclotherm. And there are 16 intermediate sizes to choose from.

AUTOMATIC OPERATION

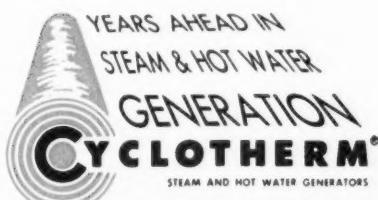
Cyclotherms operate with automatic efficiency. On 15 to 60 HP units, burner automatically shuts down when steam demands are satisfied, automatically turns on when more steam is needed. On 80 to 750 HP units, modulation controls regulate firing rate from 30% to 100% of rated capacity, without loss of efficiency. Operation stops automatically if firing sequence is interrupted and unit "fails safe."

BUILT TOGETHER TO WORK TOGETHER

Cyclotherm burner and boiler are built together to work together — one manufacturing responsibility back of the entire equipment. Units are fire-tested at factory, shipped ready to operate. Cyclotherms are up to 1/3 smaller than other package boilers of same capacity. Installation is easy—no costly stack, no excavation, no foundation.

"CYCLONIC COMBUSTION"

"Cyclonic Combustion"—Cyclotherm's patented combustion principle—guarantees a minimum of 80% efficiency, meets all state requirements, conforms to A.S.M.E. and National Board standards, carries Underwriters' Laboratories label. Steam Generators from 15 HP to 750 HP, burn oil and/or gas. Hot Water generators in 10 capacities, from 670, 000 BTU per hr. to 6,700,000 BTU per hr.



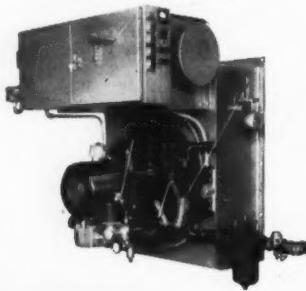
A Division of National-U. S. Radiator Corp. • 57 E. First St., Oswego, N. Y.

Clip to Your Letterhead

57

Please send me your booklet Cyclotherm Cyclonic Combustion, also rotogravure copy of Cyclotherm Sales Steam with illustrations and descriptions of Cyclotherm installations.

Model FDC for Firebox Type Boilers



JOHNSON
Package-Unit

FORCED DRAFT BURNERS

*For Smoother, More Efficient Combustion
regardless of Stack Conditions and Firebox Pressures*

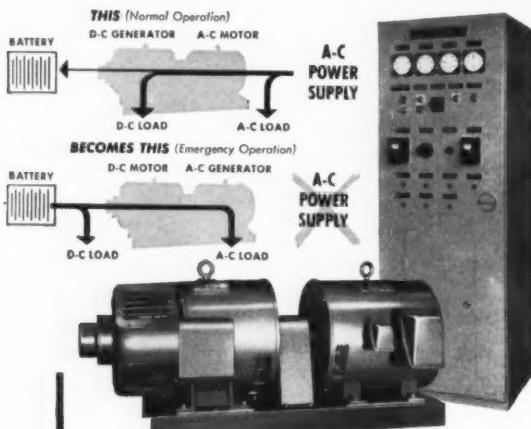
These compact units are the last word in oil-heating efficiency and economy. They are wired, tested and completely assembled at the factory for quick, inexpensive installation. Two models are available, for either Scotch Type Boilers or Firebox Type Burners as illustrated here.

They are built to fire on Oil Only . . . Gas Only . . . or for Combination Oil or Gas Firing. These package unit burners all are powered by the famous Johnson Model 53 Burners which maintain a fixed air-fuel-ratio regardless of variations in oil temperature and viscosity. Nine sizes are at your service . . . from 28HP to 560HP . . . to fill every type and variety of heavy-duty heating need.

J
Johnson
B Oil
Burners

S. T. JOHNSON CO.

940 ARLINGTON AVE. CHURCH ROAD
OAKLAND 8, CALIF. BRIDGEPORT, PA.



Inverter-Diverter THE ONLY CONTINUOUS A-C AND D-C POWER SYSTEM

This standby Power System changes instantaneously from normal to emergency operation (when the normal a-c power supply is interrupted for any reason) without appreciably affecting voltage or frequency. Ideally suited for any application where UNINTERRUPTED service for either or both a-c and d-c loads is required.

The Inverter-Diverter requires less space, reduces installation time, and cuts maintenance. For complete details:

ASK FOR BULLETIN 21-200

ELECTRIC PRODUCTS COMPANY

EP

1725 CLARKSTONE ROAD

CLEVELAND 12, OHIO

Parsons & Whittemore/Lyddon will direct the overall planning, equipment supply, erection, and start-up of the mill.

Detroit to Get New Skyscraper

Work will get under way early next spring on the Michigan Consolidated Gas Building, which will occupy a full city block in downtown Detroit. Minoru Yamasaki and Smith, Hinchman, Grylls, Associated Engineers and Architects have combined operations on the project.

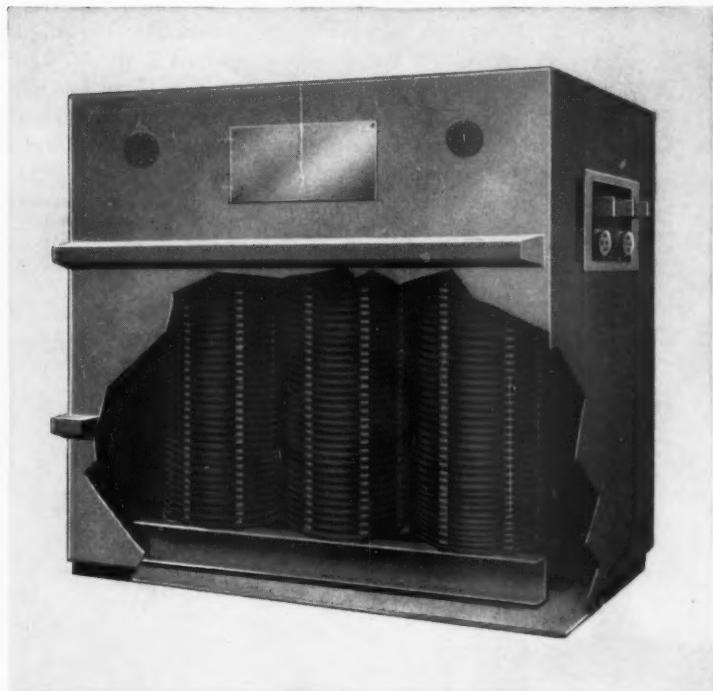
Unusual features of the building include a six-sided window design which eliminates all horizon-



Six sided window design eliminates horizontal lines from superstructure of new Detroit office building.

tal lines from the superstructure and emphasizes the vertical columns and window dividers. The 4800 windows will be in the shape of elongated hexagons encased in stainless steel frames. The white exterior walls will be made of chips of marble or quartz, bonded together with cement and honed to a smooth finish. The building will be completely

The Inside Story on Costs



Look Deeper than the Surface When Specifying Transformers

What a transformer will or won't do . . . its installation and maintenance costs . . . are determined to a large degree by its insulation.

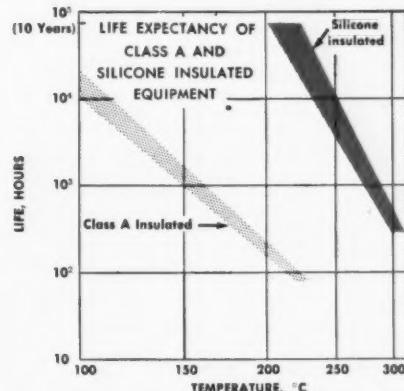
You can assure these four cost-saving factors by specifying a silicone insulation system:

Lowest Cost Installation: Easier to handle and easier to install, they require no costly vaults or barriers . . . can be placed right at load or load center for additional savings on costly low-voltage cable. Silicone insulated dry-types are up to 40% lighter than non-inflammable liquid filled units. Minimum floor loading means least costly supporting structure.

Lower Operating and Maintenance Costs: Virtually maintenance-free, silicone insulated transformers have no liquids to filter or change. Need no space heaters to keep windings dry when de-energized.

Maximum Safety: Completely dry, they're completely safe! No danger of fire . . . no toxic fumes. Silicone insulated transformers have proved safe under extreme overload and short circuit conditions.

Maximum Reliability: Depending on design, they withstand overloads of 25% to 50% and more above rated capacity. The extra thermal capacity of silicones, demonstrated by the curves in the next column, assures uninterrupted, reliable power.



Today, transformer manufacturers offer two basic designs insulated with Dow Corning Silicones—sealed dry-types and open dry-types.

For power station auxiliaries, you can achieve maximum reliability and minimum maintenance with a silicone-insulated sealed dry-type unit. Requires only a periodic check of pressure gauge and bushings. Or you can save weight by specifying a silicone-insulated open dry-type unit . . . it's ideal for balconies and other minimum floor loading areas.

For underground distribution systems, select a silicone-insulated sealed dry-type network transformer. Fits easily into existing vaults. Undamaged even if flooded, only the bushings, pressure gauge and case need infrequent inspection.



Sealed dry-type transformers require virtually no upkeep.

Send today for full information on silicone-insulated, dry-type transformers and list of manufacturers offering equipment insulated with Dow Corning Silicones. Address Dept. 1022.

SPECIFY Dow Corning Silicones
and **SAVE!**

first in
silicones

Dow Corning CORPORATION

MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

FREE - The Full Story Of Economical Infra-Red Comfort Heating

Industrial and commercial buildings of all kinds are now being heated by economical gas-fired overhead PANELBLOCS — the unit that "Heats Like the Sun." Panelbloc offers an entirely new heating concept. Unlike traditional heating equipment that heats the air, Panelbloc heats objects and people.

Panelbloc is low in first cost, installation is economical, since no electrical connections are needed. No fans or motors are needed for these unique heaters.

We have a complete literature file on this equipment, and you are welcome to any items you'd like to have. Just check the coupon and mail to us.

Gentlemen: Please send me literature checked:

PANELBLOC CATALOG
This pictures and describes the equipment, gives dimensions and technical data operating principle.

PANELBLOC CASE HISTORY
Tell us what your business is, and we'll send you a case history describing Panelbloc in a business similar to your own.

PANELBLOC PHOTO ALBUM
This lavishly illustrated brochure shows actual installations in wide range of com-

TRADE PAPER REPRINTS
Learn what the experts say about Panelbloc.

B **PANELBLOC DIVISION**
The Bettcher Mfg. Corp.
3106 West 61 St., Cleveland, Ohio

OVERHEAD PANELBLOC



HOTEL MEDFORD

Motel convenience in the heart of downtown Milwaukee
Drive-In Entrance and Parking
Party, Banquet and Group Facilities
Over 300 comfortable rooms
from \$5 with bath

FAMILY RATE PLAN

MILWAUKEE

605 NORTH 3RD STREET

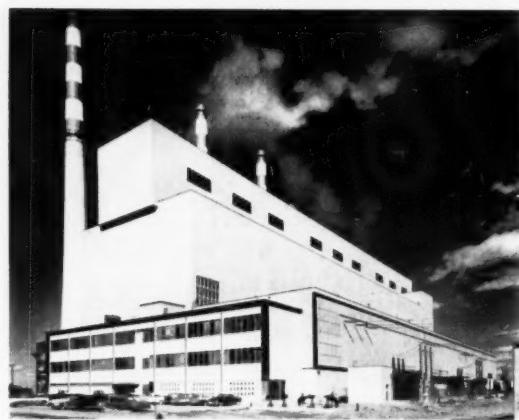
air conditioned with gas. Boilers, air conditioning equipment, and cooling tower will be located in the crown of the building.

Directory of Highway Officials

More than 1700 names, titles, and addresses of administrative engineers and officials in the 50 state highway departments, the District of Columbia, and Puerto Rico are listed in the 1959 ARBA pocket-sized directory of *Highway Officials and Engineers*. As in the past, the directory may be obtained for \$1.00 from the American Road Builders' Association, World Center Building, Washington 6, D.C.

Porcelain Sheathing for Steam Station

Over 200,000 lbs of porcelain enamel on aluminum, ranging from insulated panels to specially designed grid-wall office section, were used on the new Thos. H. Allen Electric Generating Station serving Mem-



Thos H. Allen Station has an output of 862,500 kw. Panels of porcelain on aluminum sheath the building.

phis. Designers and supervisors of construction on the project were Burns and Roe, Inc., consulting engineers of New York City.

Walls of the main plant are only 3½-in. thick. Panels have a glass fiber core with the outer aluminum skin finished in green porcelain enamel. Insulation is superior to a 12-in. masonry wall.

Bridge for Japan's Inland Sea?

A survey soon will be under way to determine the feasibility of connecting the Japanese mainland with Shikoku via long suspension bridges leapfrogging from island to island. In the event this proves unworkable, an alternate plan for tunnel construction will be studied.



**the bolt
on the right
is new**

COMPARISON TABLE

	DARDELET RIVET BOLT	HIGH STRENGTH BOLT	HIGH STRENGTH BEARING BOLT
ASTM designation	none	A 325	A 325
Comparative shear strength (% Dardelet = 100%)	100%	159%	177%
Tensile strength	70,000 lbs.	90,000 to 120,000 lbs.	90,000 to 120,000 lbs.
Resistance to slippage	good	fair	excellent
Resistance to vibration	good	good	excellent
Men required to install	one	two	one
Equipment required	sledge and hand wrench	impact wrench and hand wrench	maul and impact wrench
Installation cost	equal to or less than rivets	less than rivets	less than rivets
Washers required	none	two	one

LAMSON HIGH STRENGTH BEARING BOLT*

Combines the tensile strength of a hex head high strength bolt with the bearing of a rivet.

Has the highest shear strength and greatest resistance to slip of all structural bolts.

Costs the same as the Lamson Dardelet Rivet Bolt (left) and the Lamson High Strength Bolt (center).†

Size for size, this new bolt costs the same as the other two, yet provides a more rigid structure at less cost. Field tests have proved its superiority, and already many structures have been erected using this bolt.

The new Lamson High Strength Bearing Bolt is available now through 20 U. S. Steel Supply Division Steel Service Centers in key locations throughout the country.

Write Lamson & Sessions for Bulletin HSBB. Contains pertinent engineering data. Firm names, and locations where these bolts have been used, will be mailed promptly on request.

*Pat. App. for

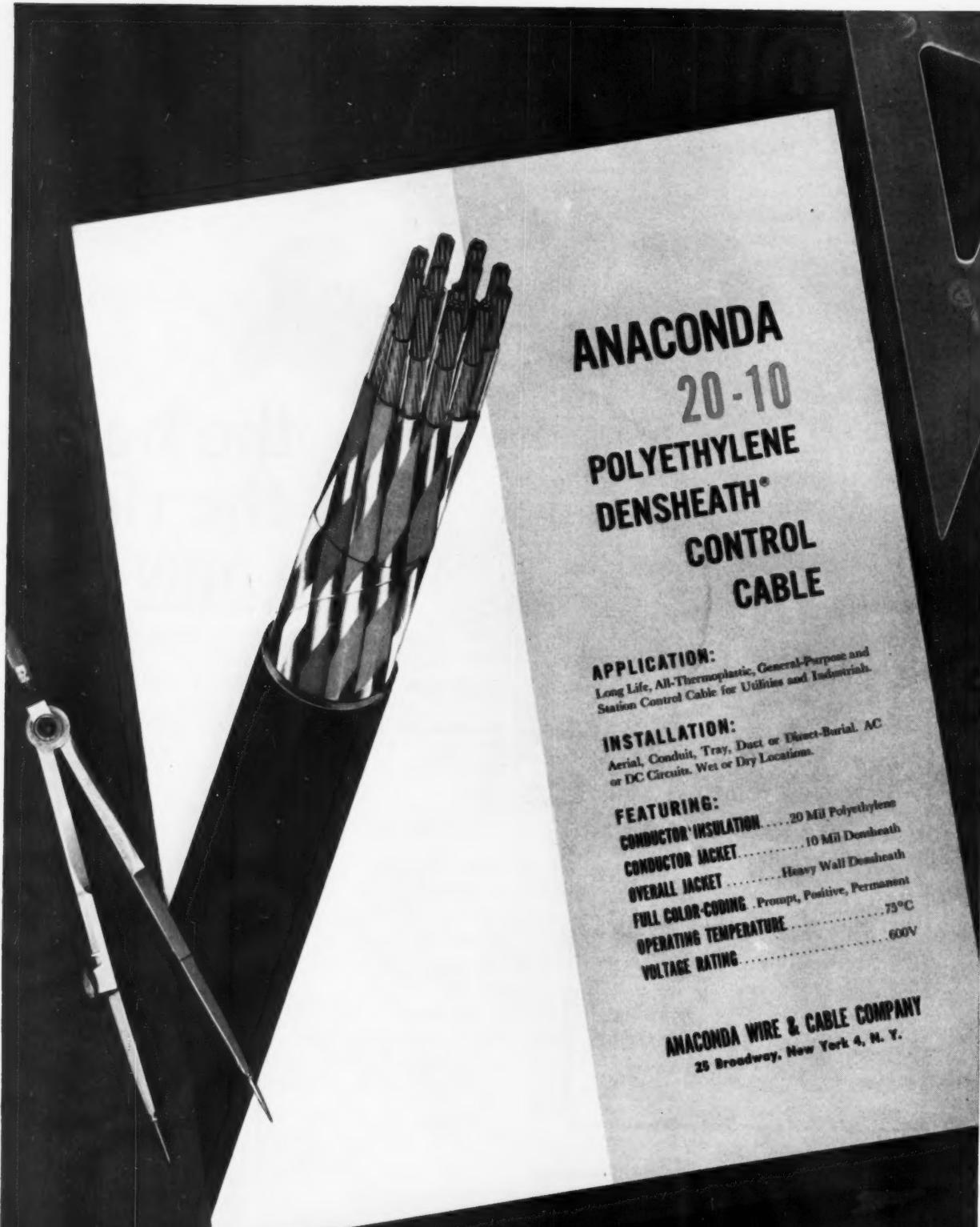
†Cost based on using bolts with nuts and washers as shown.

LAMSON & SESSIONS

5000 TIEDEMAN ROAD • CLEVELAND 9, OHIO

Plants in Cleveland and Kent, Ohio • Chicago and Birmingham





ANACONDA **20-10** **POLYETHYLENE** **DENSHEATH®** **CONTROL** **CABLE**

APPLICATION:

Long Life, All-Thermoplastic, General-Purpose and Station Control Cable for Utilities and Industrial.

INSTALLATION:

Aerial, Conduit, Tray, Duct or Direct-Burial, AC or DC Circuits. Wet or Dry Locations.

FEATURING:

CONDUCTOR INSULATION	20 Mil Polyethylene
CONDUCTOR JACKET	10 Mil Densheath
OVERALL JACKET	Heavy Wall Densheath
FULL COLOR-CODING	Prompt, Positive, Permanent
OPERATING TEMPERATURE	75°C
VOLTAGE RATING	600V

ANACONDA WIRE & CABLE COMPANY
25 Broadway, New York 4, N. Y.

ANACONDA OFFERS ONE CONTROL CABLE FOR PRACTICALLY ALL 600-VOLT APPLICATIONS: ANACONDA THERMOPLASTIC 20-10 CONTROL CABLE!

**Polyethylene—Densheath* (PVC)
construction provides superior fea-
tures, makes possible new econo-
mies and improved service through
standardization.**

Anaconda—after testing a wide range of designs — recommends 20-10 Control Cable as today's superior all-purpose thermoplastic cable for 600-volt service. Here is a standard control cable for practically every 600-volt application —one that simplifies your ordering, stocking, installing, makes possible new economies in time and money.

Anaconda 20-10 Control Cable has been designed to meet all the exacting requirements for

the highest quality control cable. Each conductor is insulated with 20 mils of polyethylene, then covered with 10 mils of Densheath (PVC). This construction combines the full IPCEA recommended insulation thickness (30 mils for 600 volts) with the flame retardance, excellent color coding and abrasion-resistance of PVC.

This composite design results in a control cable that can be used in virtually all 600-volt control applications. It can be installed aerially, in conduits, trays or ducts, and directly buried.

For 1000-volt rating, this same design is recommended, with the thickness of Polyethylene and Densheath (PVC) increased to 30 and 15 mils respectively.

Write for descriptive bulletin DM-5844 for complete technical details on Anaconda 20-10 Control Cable. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Reg. U.S. Pat. Off. 59226

**ASK THE MAN FROM
ANACONDA®
FOR 20-10 CONTROL CABLE**

**ANACONDA WIRE & CABLE COMPANY
25 Broadway, New York 4, New York**

CE

Gentlemen:

Please send me a copy of Bulletin DM-5844 containing full technical information on Anaconda 20-10 Thermoplastic Control Cable.

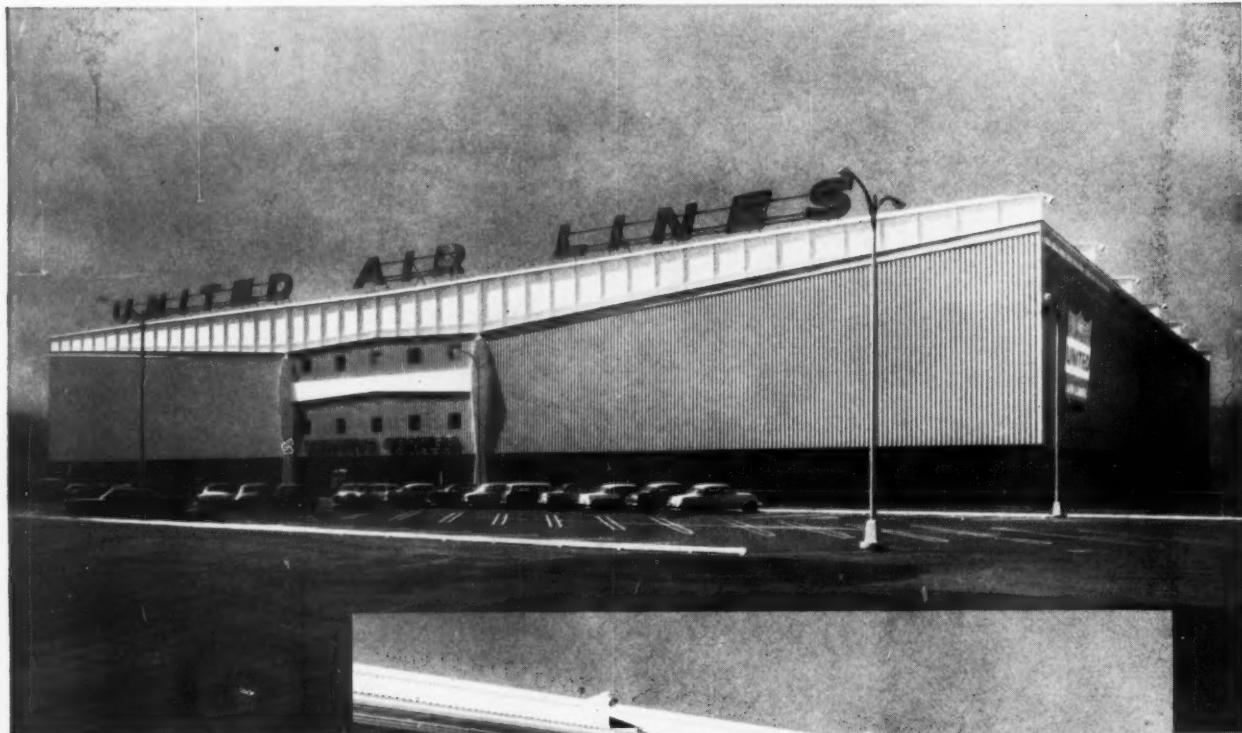
Name.....

Company.....

Address.....

City..... Zone..... State.....

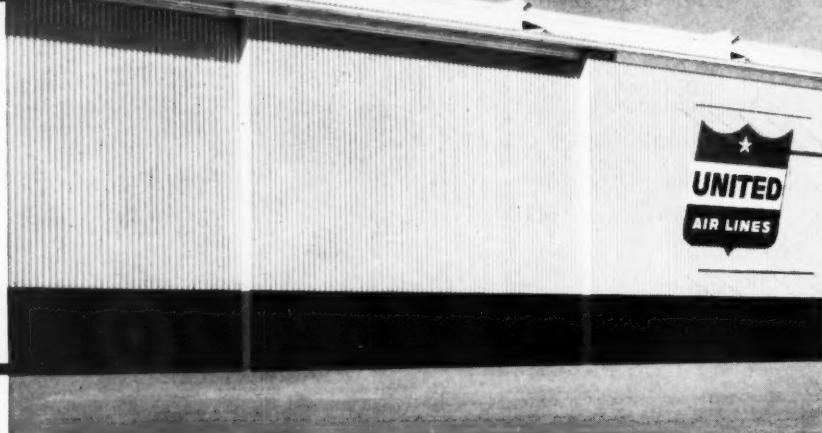
Mahon METAL CURTAIN WALLS



United Air Lines Service Center at San Francisco, Cal. Mahon Metal Curtain Walls were employed to lend trimness and to retain the clean lines of this unique structure which was designed to accommodate four mammoth DC-8 Jet Air Liners. Mahon Curtain Wall Plates, of the same material and pattern, were also employed as exterior facing on the large hangar doors.

Architects & Engineers
Skidmore, Owings & Merrill

General Contractor
Dinwiddie Construction Company

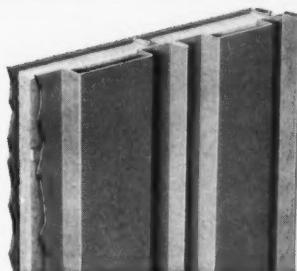


Serving the Construction Industry Through Fabrication of Structural Steel, Steel Plate Components, and Building Products

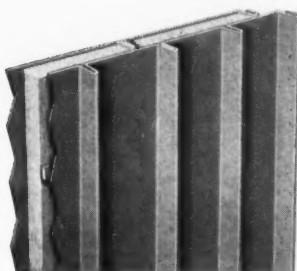
Produce a Clean, Distinctive Wall Texture in Any Type of Structure!

Mahon Walls can be Erected up to 60 Ft. in Height without a
Horizontal Joint . . . Vertical Joints are Invisible

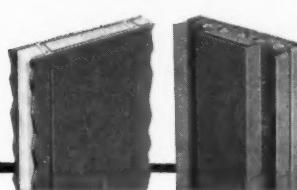
ALUMINUM or STAINLESS
GALVANIZED or PAINTED STEEL



MAHON FLUTED WALL
FIELD CONSTRUCTED



MAHON RIBBED WALL
FIELD CONSTRUCTED



MAHON PREFAB WALL PANELS

of Steel and Aluminum

★ OTHER MAHON BUILDING PRODUCTS and SERVICES:

- Underwriters' Rated Metalclad Fire Walls
- Rolling Steel Doors (Standard or Underwriters' Labeled)
- M-Floors (Electrified Cellular Steel Sub-Floors)
- Long Span M-Decks (Cellular or Open Beam)
- Steel Roof Deck
- Permanent Concrete Floor Forms
- Acoustical and Troffer Forms
- Acoustical Metal Walls and Partitions
- Acoustical Metal Ceilings
- Structural Steel—Fabrication and Erection
- Steel Plate Components—Riveted or Welded

★ For INFORMATION See SWEET'S FILES
or Write for Catalogues

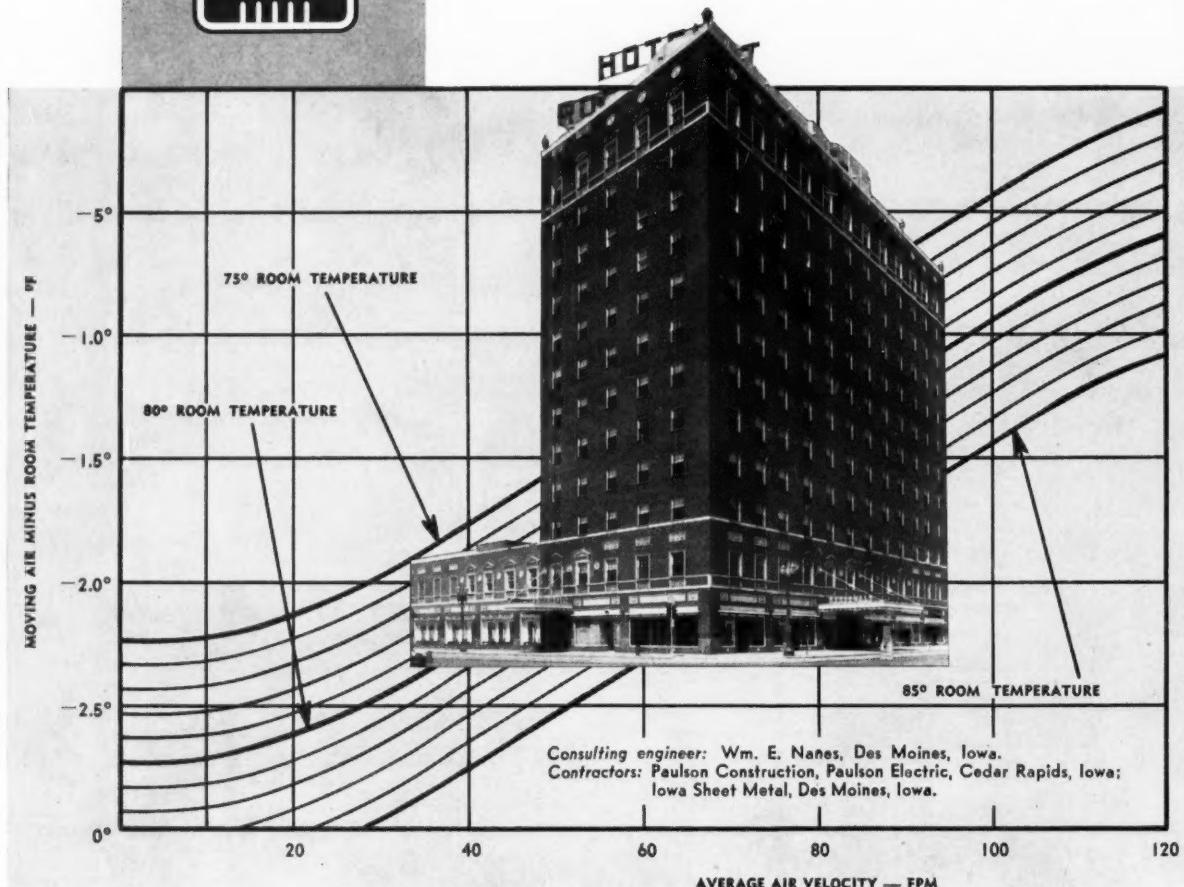
THE R. C. MAHON COMPANY • Detroit 34, Michigan
Sales-Engineering Offices in Detroit, New York, Chicago and Los Angeles
Representatives in all Principal Cities

MAHON

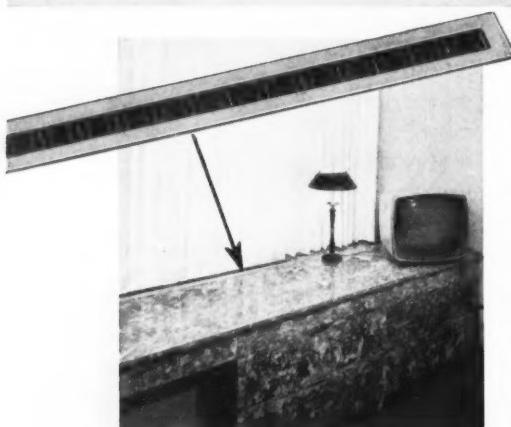
THE MARK OF QUALITY



Comfort Chart conditions



Consulting engineer: Wm. E. Nanes, Des Moines, Iowa.
Contractors: Paulson Construction, Paulson Electric, Cedar Rapids, Iowa;
Iowa Sheet Metal, Des Moines, Iowa.



(Above) Interior at Hotel Roosevelt, Cedar Rapids, Iowa, showing under-window installation of Barber-Colman Uni-Flo Continuous Line diffusers.

Comfort Chart conditions. It is impossible to provide uniformly comfortable air conditioning without the correct correlation between air movement and room temperature. The scientifically correct relationship necessary to provide human comfort is plotted on the Barber-Colman Comfort Chart shown above. This chart developed and used by Barber-Colman engineers indicates conditions of air movement and temperature in an occupancy zone. The line shown for each average room temperature indicates the minimum limit of satisfactory comfort conditions. Points above the line fulfill human comfort standards.

With a Barber-Colman "combination system" — Electronic controls and Uni-Flo engineered air distribution products — you are assured of continuous system performance well within these standards.

One Source... Undivided Responsibility . . .

at Hotel Roosevelt

CEDAR RAPIDS, IOWA



Barber-Colman Electronic Control Center provides quick, easy remote management of the Hotel Roosevelt air conditioning system.

Ideal indoor weather guaranteed by Barber-Colman automatic controls and air distribution components working together in a "combination system"

Consulting engineer, Wm. E. Nanes, who handled the air conditioning project at the Hotel Roosevelt calls it "our job of tomorrow" and refers to the Barber-Colman Electronic Control Center as "second to none."

Roosevelt Hotel president, Sutherland Cook, says, "We are delighted with the comfort that this system

provides for our guests. The year-round air conditioning is an essential and integral part of the immense modernization program which has made our hotel one of the most modern in the country."

For your new construction or modernization projects, inquire about the relationship between Barber-Colman Electronic Controls and Uni-Flo engineered air distribution products which makes it possible to guarantee comfort chart conditions to your clients.

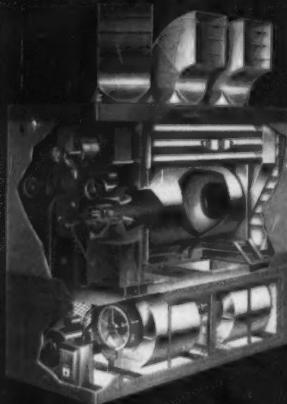
Call your local Barber-Colman office for latest descriptive literature or see our catalogs in *Sweet's Architectural File*.

BARBER-COLMAN COMPANY

Dept. T, 1660 Rock Street, Rockford, Illinois

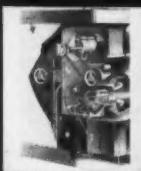
LENNOX

"OG" SERIES
INDUSTRIAL HEATER



Remarkable Adaptability

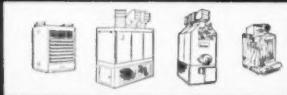
Efficient heat transfer design results in reduced physical size of this heater . . . allowing it to take up a minimum of space. If floor space is at a premium, the "OG" can be suspended horizontally or inverted. Removable nozzles permit free standing or ducted installations.



DUAL FUEL Power Burners

Burner operates equally well with either gas or oil. Change-over is instant and automatic.

LENNOX "Task-Matched" Equipment to control and condition air for industry



64,000 to 2,000,000 Btu/h

**CLIP AND MAIL FOR
FREE SPEC SHEETS**

LENNOX Industries Inc.

INDUSTRIAL DIVISION
P.O. Box 1294, Dept. CE-8
Des Moines 5, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox "OG" Series Industrial Heaters

Name.....
Company.....
Address.....
City.....
Title.....



Men in Engineering

Dr. Antole R. Gruehr, head of the economics department of the Polytechnic Institute of Brooklyn, recently has taken office as president of the New York State Society of Professional Engineers.

Officers installed with Dr. Gruehr are: Victor E. Hall, Consulting Engineer, Syracuse, vice president; Charles A. Hescheles, United States Rubber Company, second vice president; John A. Mathes, Consolidated Edison Company of New York, Inc., financial secretary; and Daniel J. O'Connell, Consulting Engineer, Bronx, treasurer.

James A. Burton, retiring chief engineer of the consulting engineering firm of E. B. Steele Company, Boise, has been appointed to the new position of District Engineer of The Asphalt Institute for the states of Idaho and Montana. Burton will establish his headquarters in Helena, Mont.

Michel K. Antarakis and Billy E. Tindell have joined Benham Engineering Company, consulting engineers of Oklahoma City and Muskogee, Oklahoma. Antarakis recently received his M.S. degree in civil engineering from Oklahoma State University; Tindell is a June graduate of Oklahoma University, having received a bachelor's degree in architecture.

Allyn W. Falls, management consultant, is now associated with Ebasco Services Incorporated, in the San Francisco office of the firm.

Prior to joining Ebasco, Falls was assistant to the president of D. Cisneros and Company, a Venezuelan firm representing all of General Dynamics Corporation's Venezuelan activities.

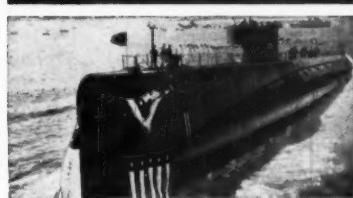
Rader and Associates has moved to new offices on floors eight and nine of The First National Bank Building, 100 Biscayne Boulevard, South, Miami 32, Florida.

George F. Herold, partner in the firm of Rebmann Gay Herold, Consulting Engineers, has been elected secretary-treasurer of The Joint Council of the Associated Engineering Societies of St. Louis.

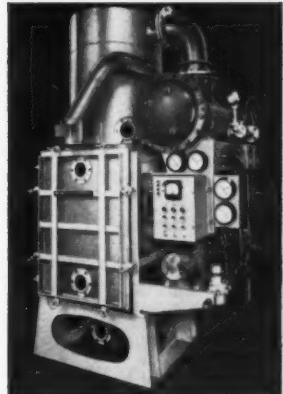
Bogert and Childs, Consulting Engineers, has announced the retirement of Fred S. Childs. In the future the firm will operate under the name of Clinton Bogert Engineers. Offices will continue to be located in New York City, Hackensack, New Jersey, and South Norwalk, Connecticut.

Ray M. Boynton, Associate of Dr. D. B. Steinman, Consulting Engineer, of New York City, has been awarded the honorary degree of Doctor of Engineering by his alma mater, the University of Maine.

John C. Narber has been appointed director of planning of Charles Luckman Associates, planning-architecture-engineering firm of Los Angeles and New York. In his new position, Narber will direct all ac-



OFFICIAL PHOTOGRAPHS: U. S. NAVY, U. S.
COAST GUARD, ROYAL CANADIAN NAVY



For a reliable supply of fresh water, specify Maxim Evaporators for naval—and commercial—ships. Write for technical manual, "Fresh Water Unlimited."

MAXIM evaporators
produce the vitally
important fresh water
supply for more than
100 ships of the
United States and
other navies.



Emhart Manufacturing Company
Maxim Division / Dept. 80
Box 216, Hartford 1, Conn.

EMHART

tivities concerned with master planning, facility planning, research and analysis, and zoning. Narber joined the Luckman organization in 1955 as chief industrial planner and engineer. For the past two years he has been director of facility planning.

Robson & Woese, Inc. has moved its offices to 315 Alexander Street, Rochester, New York.

John R. Coffin, senior vice president, Jackson & Moreland, Inc., Boston, Massachusetts, has been elevated to the grade of fellow of the American Institute of Electrical Engineers "for his contributions to engineering management and economical evaluation and design of large power projects."

Alexander Matiuk has been elected vice president and director of engineering of Burns and Roe, Inc., New York consulting engineers and constructors. Matiuk will direct all

engineering and design activities, including related architectural and estimating functions, and will coordinate the work of all technical departments.



MATIUK PETRASCH

Carl S. Petrasch, Jr., vice president of Ford, Bacon & Davis, Inc., engineers and business consultants, has been elected a member of the board of directors of the company and of Ford, Bacon & Davis Construction Corporation.

M. L. Clough has joined the management consulting staff of Ebasco

Services Incorporated. Prior to joining Ebasco, Clough was senior staff consultant to SIMCA, second largest automobile producer in France.

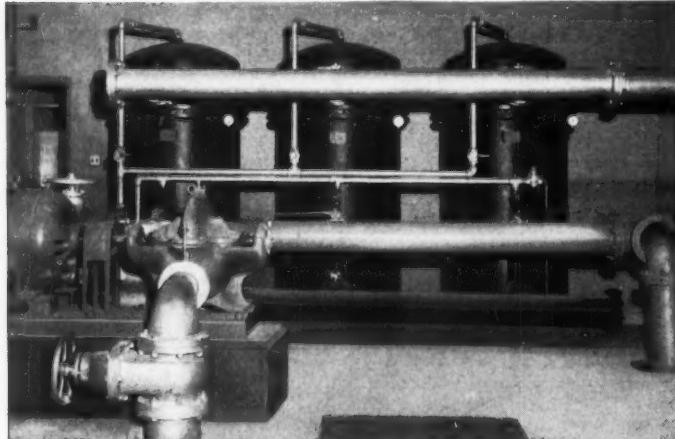
A new consulting engineering firm, Diver Brothers, has been formed for the practice of civil and structural engineering. Offices are located at 2221 Maryland Avenue, Baltimore, Maryland.

S. Murray Rust, Jr., president of the Rust Engineering Company, Pittsburgh, has been elected to a six-year term as an alumnus trustee of Lehigh University.

Ralph C. Roe, president of Burns and Roe, Inc., New York City, has been awarded an Honorary Doctor of Engineering degree from Stevens Institute of Technology for his contributions to the design and construction of power plants.

Robert P. Guarino, P.E. and Leon A. Schute, R.A. announce the for-

ADAMS DIATOMITE FILTERS ARE *BEST...*



Shown above is a typical Adams filter installation handling the entire water supply of a small eastern community. The three units are capable of handling more than 1500 gpm. with plenty of spare capacity for peak periods.

for Small Community Water Systems

Maximum filter efficiency and capacity, coupled with minimum space requirements, enable the Adams line of diatomaceous earth filters to more effectively solve small community water filtration problems. Diatomite filtration assures you a water supply of sparkling clarity...the year 'round.

Exclusive Adams Hydro-Pneumatic backwashing simplifies operation—for more complete and rapid backwash and reduced labor requirements. The Adams filter systems are compact—do not require extensive ground area, elaborate foundations and other expensive construction features.

Why not investigate how an Adams system can improve your water supply. Write today—

R. P. ADAMS CO., Inc. • 256 East Park Drive, Buffalo 17, N. Y.



Not 20 to 30 minutes—

but

Just 7 seconds to insulate

this bend!

New Johns-Manville AEROTUBE insulation

cuts labor costs 50%...and more!

New Aerotube® Insulation entirely eliminates twine wrapping, skirting and other time-consuming methods of insulating lines that sweat!

On a straight run of pipe or the most complex bend—Aerotube goes on fast! Just slides on new lines . . . six feet at a time . . . in a matter of seconds! On connected pipe, the job takes but little longer. Just the time it takes to slit Aerotube longitudinally, snap on pipe, and cement.

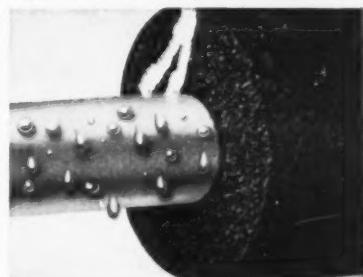
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Use Aerotube wherever an effective vapor-sealed insulation is needed—air

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Send for informative new AEROTUBE brochure, IN-213A. It illustrates methods of fitting AEROTUBE to all types of fittings . . . sweat and screw type joints . . . and connected pipe. Gives best thicknesses for various design conditions, with helpful facts on sizes, packaging data and

dimensions. Write for your free copy now! Address Johns-Manville, Box 14, N.Y. 16, N.Y. In Canada, Port Credit, Ont.



Aerotube insulation is its own vapor barrier.

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mation of a partnership for the practice of engineering and architecture. Offices are located at 332 S. Wren Street, High Point, North Carolina and in the State Commercial Bank Building, Office 305, Thomasville, North Carolina.

Paul B. Ostergaard, formerly staff acoustical engineer of Carrier Corporation, has been appointed senior engineer of Lewis S. Goodfriend & Associates, consulting engineers in acoustics, of Montclair, New Jersey. In his new position, Ostergaard will serve the firm's clients in the industrial and community noise fields and supervise the new laboratory being constructed by the firm to study air conditioning noise and to performance-test air conditioning silencing devices.

Melvin T. Ulteig, president of the Ulteig Engineering Corporation, Fargo, North Dakota, has announced the association of his company with the Minneapolis firm of

Bruch, Morrow and Knafla, Inc., Consulting Engineers. In conjunction with this association, the Ulteig firm has opened offices at 1645 Hennepin Avenue, Minneapolis, Minnesota.



ULTEIG

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D. O. Turnbull, P. Eng. has been elected president of the Canadian Council of Professional Engineers. Other officers are: J. G. Dale, P. Eng., vice president, W. L. Wardrop, P. Eng., member of the executive committee, and Leopold M. Nadeau, P. Eng., executive secretary for another term.

After 50 years of continuous service as a municipal engineering consultant, C. Robert Fulton has retired from active participation in the firm of Fulton & Cramer, consulting engineers, of Lincoln, Nebraska. Announcement also has been made of admission to the partnership of James D. Kissell and Marvin L. Garber.

A new partnership, Spence & Weinel, has been formed for the practice of consulting engineering, with offices at 3837 West Pine Boulevard, St. Louis, Missouri. Principals are Thomas H. Spence, formerly chief of construction and surveys for The Metropolitan Saint Louis Sewer District and Cay G. Weinel, Jr., formerly chief engineer, Crow Contracting Corporation and design engineer for Russell & Axon, Consulting Engineers.

Michael L. Mascia has joined the field engineering department of A. M. Kinney, Inc., consulting en-

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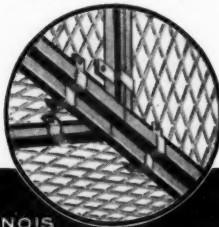
...will answer all your enclosure problems

A detailed technical illustration of a large-scale expanded metal partition system. It features a grid of vertical and horizontal bars forming a mesh pattern. A central section is shown with a different, smoother surface, likely representing a door or a panel. The entire structure is supported by a sturdy metal frame with legs.

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

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Note enlarged detail showing SAFE-GARD Quick-Erect Clips securely joining the interchangeable panels.



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gineers of Cincinnati and New York, as resident engineer. He formerly was vice president and chief engineer of John A. Johnson and Sons, Inc., New York City.

A new consulting engineering firm, Stack, Cohen and Purdy, has been formed, with offices at 2127 Maryland Avenue, Baltimore, Maryland. Principals are John N. Stack, Paul A. Cohen, and G. Richard Purdy.

Stone & Webster Engineering Corporation has named Howard E. Marx, veteran employee with more than 30 years' experience concentrated in electric power transmission work, to supervise construction of Project EHV (Extra High Voltage), on a site located near Pittsfield, Massachusetts.

At the Honors Convocation at Hunter College, New York City, the President's Gold Medal for Distinguished Service was presented to David B. Steinman. He

also received an honorary degree of Doctor of Engineering at the commencement ceremonies held recently at Syracuse University. This is the bridgebuilder's 20th honorary degree. He now holds honorary doctorates in science, engineering, literature, humanities, and laws, from leading universities on three continents.

At the American Society of Mechanical Engineers semiannual meeting in St. Louis, Melvin L. Baron, chief engineer for Paul Weidlinger, Consulting Engineer, was presented with the Spirit of St. Louis Junior Award for his paper titled "Response of Nonlinearly Supported Spherical Boundaries to Shock Waves." The Junior Award was established in 1938 and can be given only to Society members under 30 years of age at the time their papers are presented.

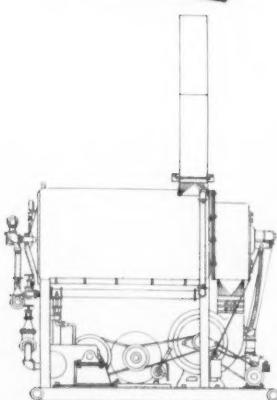
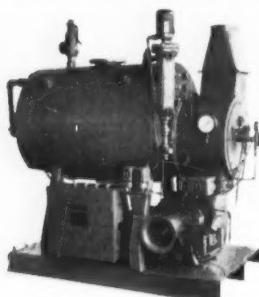
At their recent annual meeting, the stockholders of Albert Kahn Asso-

ciated Architects and Engineers, Inc., Detroit, elected V. C. Wagner, a vice president of the firm for the past three years, to the seven-man board of directors of the 65-year-old organization. Incumbent directors reelected at the meeting include: George H. Miehls, Sol King, Sheldon Marston, G. K. Scrymgeour, R. E. Linton, and G. S. Whittaker.

Executive officers elected by the board for the ensuing year are as follows: George H. Miehls, chairman and treasurer; Sol King, president; Sheldon Marston, executive vice president; G. K. Scrymgeour, vice president and secretary; R. E. Linton, G. S. Whittaker, V. C. Wagner, and Saul Saulson, vice presidents.

Professor John J. Hennigan, Jr., of the Department of Civil Engineering, Syracuse University, has joined K. G. Woodward & Associates, consulting engineers with headquarters in Webster, New York. □

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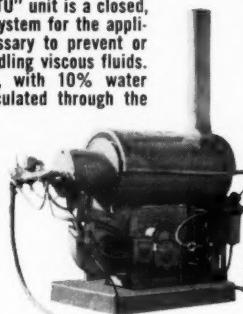
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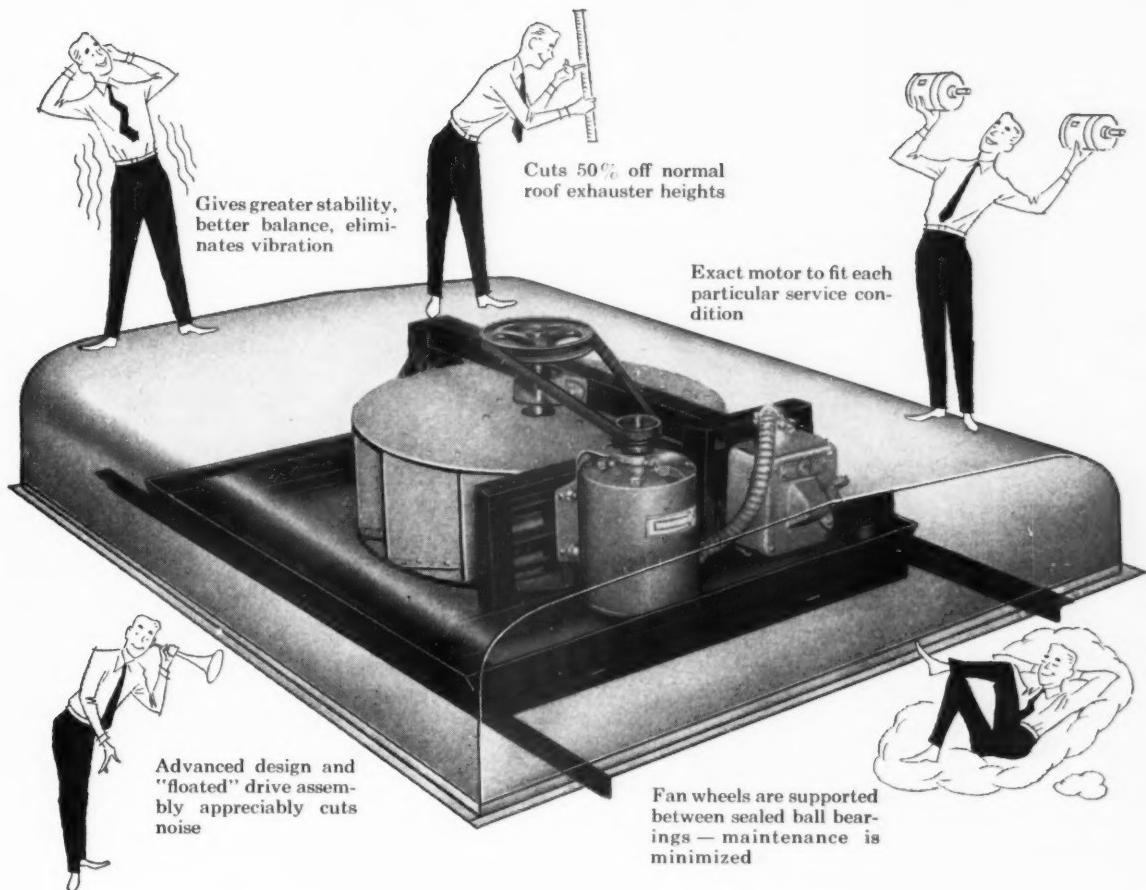
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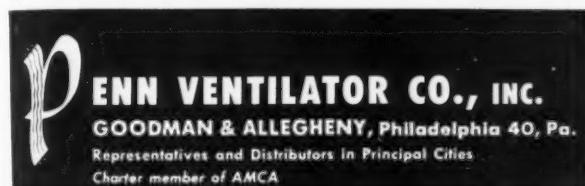
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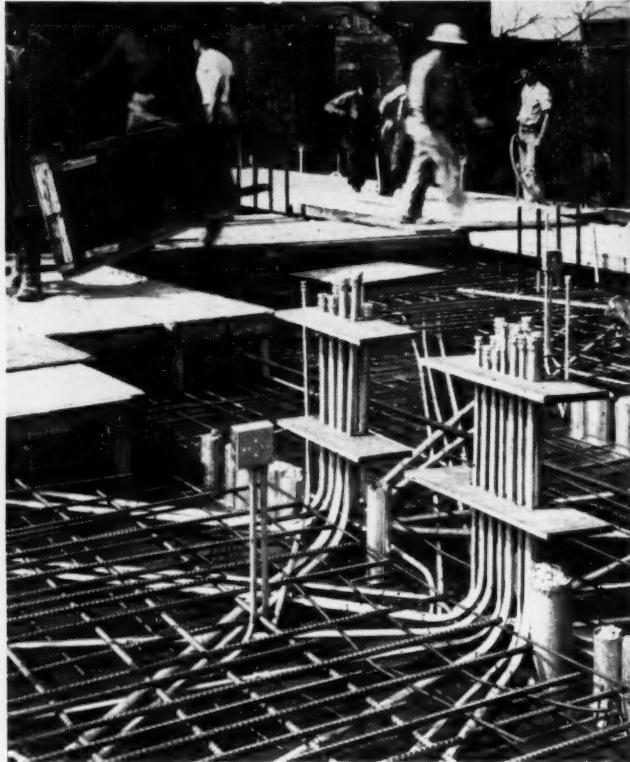
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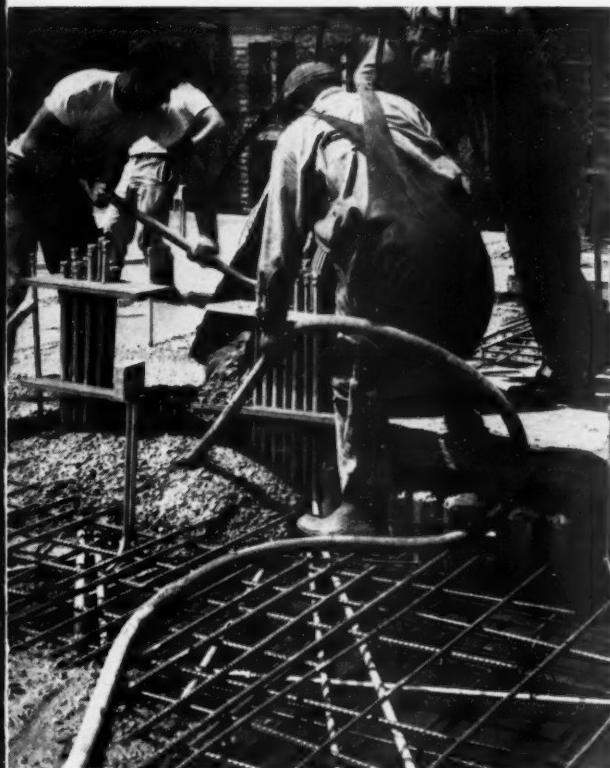
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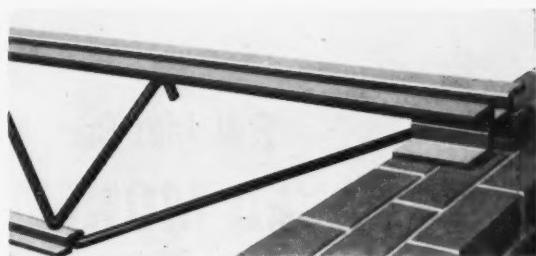
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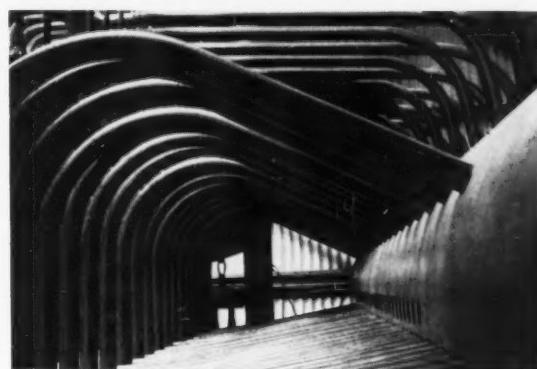
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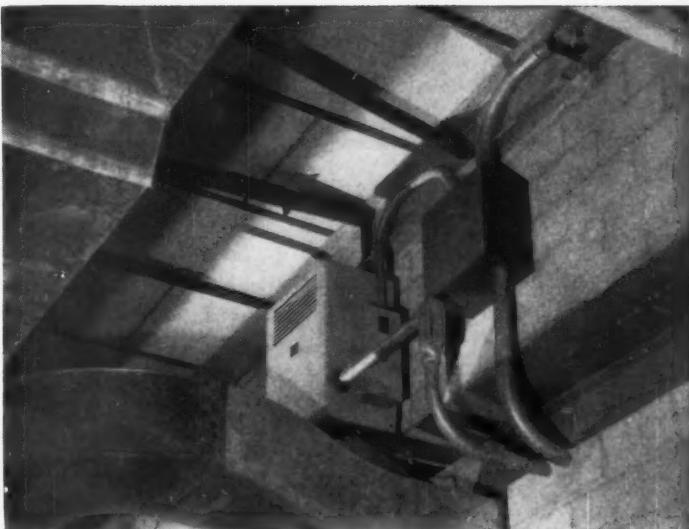
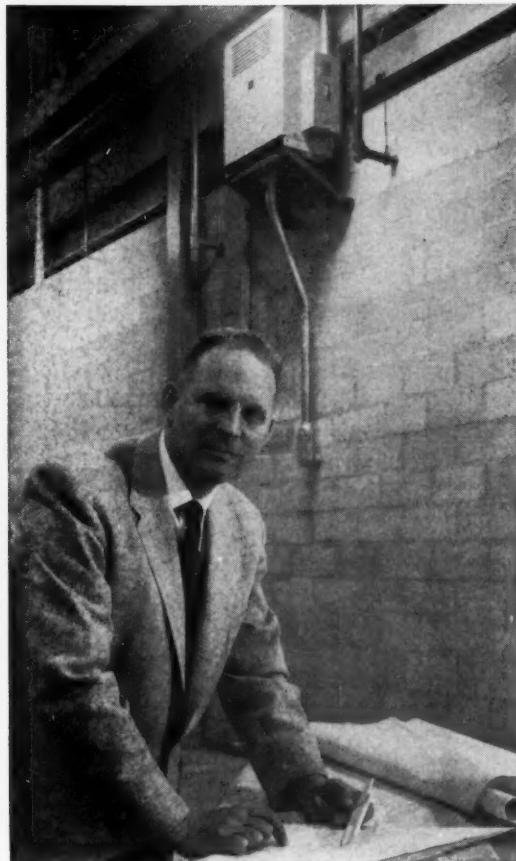
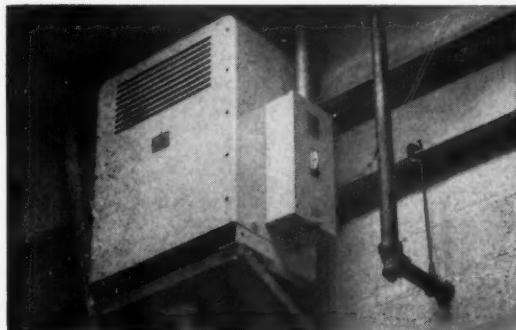
Mr. J. Bober, E. S. Burrows Co., Buffalo; C. Dean, vice president, Buffalo Electric Co., Buffalo; W. Jones, plant maintenance engineer, F. N. Burt Co., Inc., Cheektowaga, N. Y.; C. T. Hansen, Westinghouse sales engineer.

Eight Westinghouse DT-3 Transformers serve 10 acres of office and manufacturing area quietly...quietly...quietly

Inorganic siliclad insulation and grain-oriented Hipersil® steel cores have reduced Westinghouse transformer size 25 to 50%, weight 17 to 32% over former class B 80°C rise units. These Westinghouse exclusives are making possible significant savings in time and money on job after job. Not only that, but every Westinghouse unit is sound-level tested in an ambient of 24 decibels.

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Mr. Walter Jones, plant maintenance engineer for F. N. Burt Company, says: "The Westinghouse DT-3 transformers are the quietest units I've ever worked with. We employ about 900 persons—700 of them women. They're



"These transformers serve our entire plant—office, kitchen, manufacturing area, powerhouse. With 10 acres of floor space under roof, we have plenty of maintenance to handle—we really appreciate the maintenance-free design of Westinghouse DT-3 transformers," states Mr. Jones. "All we have to do with these new units is wipe them down with a damp cloth once every six months."

"In some cases," comments Mr. Dean of Buffalo Electric Co., "transformers were installed in areas congested with large air conditioning ductwork and steam piping, at times as close as 24 in. from plant ceiling. The DT-3 transformers are compact enough to fit into these tight quarters, light enough to lift into place without special hoist equipment. Easy to wire, too—terminals are located on the bottom in cool air—giving longer life and less maintenance to cables."

particularly sensitive to noise—a constant humming irritates them. Production drops as nervous tensions increase; hence, we chose Westinghouse quiet transformers."

In addition, overhead mounting without special floor supports saved valuable floor space in the mounting of this series of eight transformers in ratings from 15 kva to 150 kva. Installation time of the Westinghouse units was just one-half the time required to install wet-type units. The largest—at 150 kva—was in place in just a few hours.

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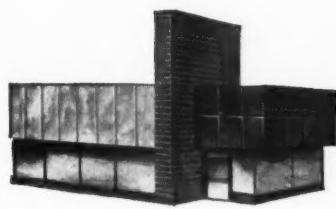
the legal interpretation is subject to clarification. Tax Research Institute, Inc. deals with these matters by inserting an observation. This represents their opinion and may later prove not to be the conclusion of the Treasury or of the courts. However, no article would be timely if every author waited until all problems were resolved.

The introduction of this book points out that this new tax law provision has changed all financial comparisons between businesses operated under a corporate as opposed to a noncorporate structure. It is equally important for a present noncorporate business to consider incorporation as it is for a present corporation to consider being taxed as a partnership or sole proprietorship. The book then proceeds to point out that while the new provision was intended primarily to avoid the double tax on corporations, it has many other important effects. The effects are briefly summarized and keyed to the page upon which subsequent comments appear.

It must be borne in mind that this book deals with corporations generally, not consulting engineers only. It also assumes that there is no legal or ethical question involved in incorporation.

The book proceeds to describe the small business or "Psuedo-Corporation" and show how it works. There is an effort made to develop the advantages and disadvantages inherent in this new law. There also is a considerable amount of

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discussion relative to the various legal ways in which a business may be conducted.

One discussion that could be of considerable interest to engineers, as members of a personal service profession, is "best salary for stockholder-employees." This approach is strictly from a tax savings standpoint, and, as is pointed out in the book, is not always possible to attain.

Carl H. Ristau, C.P.A.
Kovtan and Ristau

Maya, The Riddle and Rediscovery of a Lost Civilization by Charles Gallenkamp, will be of interest to engineer-historians. Written by a young archaeologist, who has explored the Mayan ruins and compiled a large amount of data on the early American civilization, the book also contains interesting descriptions of surprising engineering and architectural talents among the Indians.

"One of the most notable innovations brought about by the Maya in the field of mathematics was the principle of the zero. This abstract concept, essential to all but the most simplified calculations, had eluded discovery by the most advanced civilizations of the Old World. At only one other place in antiquity — among the ancient Hindus — was its use independently evolved, but the Maya were making use of the zero at a date far earlier than even Hindu mathematicians. It was represented in their inscriptions by means of a shell, an open hand, or one of several variant glyphs."

Gallenkamp recounts many of the old reasonings that Mayan civilization somehow had European origins. The author quotes authorities in discounting the theory that the existence of pyramids in Egypt and Central America implied a link. The pyramidal form suggests itself to any intelligence as the surest and simplest mode of erecting a high structure upon a solid foundation. Besides, Egyptian pyramids were places of burial, while the Mayan pyramids were built to elevate and support temples or shrines.

Gradually architects learned to construct thick-walled buildings of solid masonry to replace the stucco and thatch structures of earlier centuries. Yet the Maya never discovered the use of the true arch; instead they conceived a corbeled arch which required a ceiling steeply vaulted toward a central cap stone, causing the buildings to appear peculiarly top-heavy owing to the volume of masonry necessary to distribute the roof's weight."

Although they did not discover arches, the Mayans did have ball courts, what appear to have been public bath buildings, astronomical observatories, drainage systems, and highways.

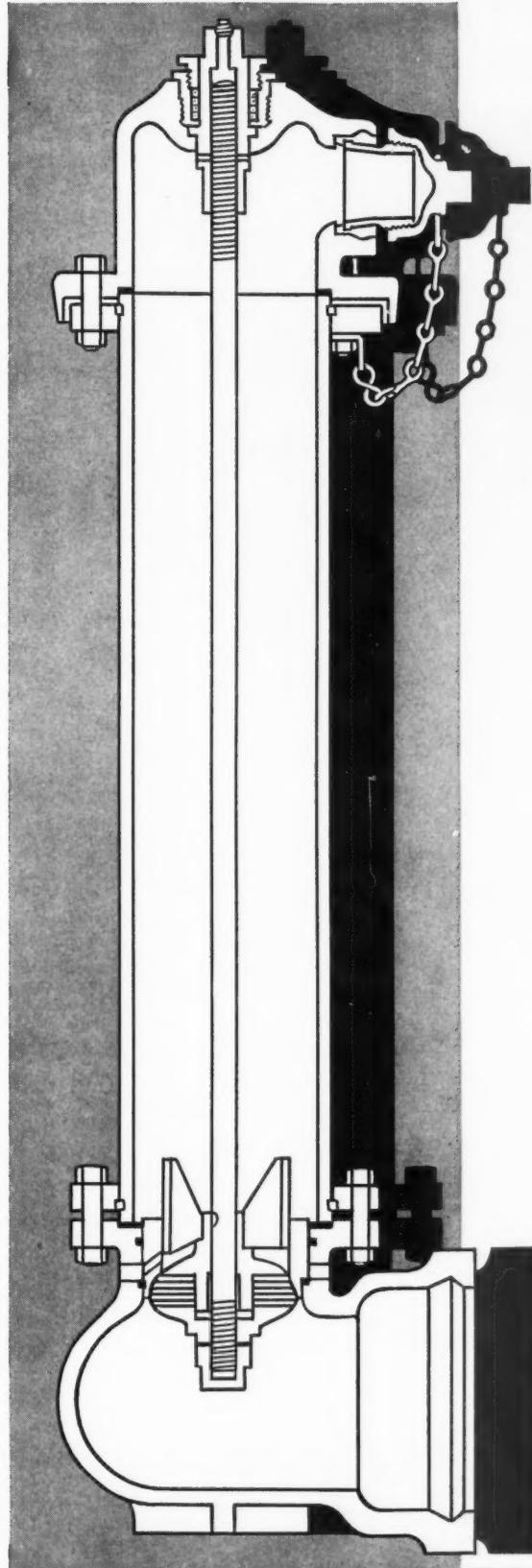
The Mayan basketball was played with a rubber ball (natural latex was known in Middle America at an early date), which was thrown through a stone ring. Scores were rare, and stakes high — the winning player sometimes being awarded the clothing and jewelry of the spectators.

Important buildings were provided with an efficient drainage system — stone troughs that carried off excess water to nearby streams or cement-lined reservoirs.

"And despite the absence of wheeled vehicles and draft animals, the Maya linked various sections of their cities with an elaborate network of roads and causeways constructed of finely cut stone over a gravel bedding. Frequently such roads connected distant cities as well, such as the intercity highway extending from Yaxuna to Coba in Quintana Roo, a distance of 62 miles."

Gallenkamp's book should inspire a little Hemisphere pride in early engineering accomplishment.

It makes no difference how mathematically inclined you are, you are bound to find something that will



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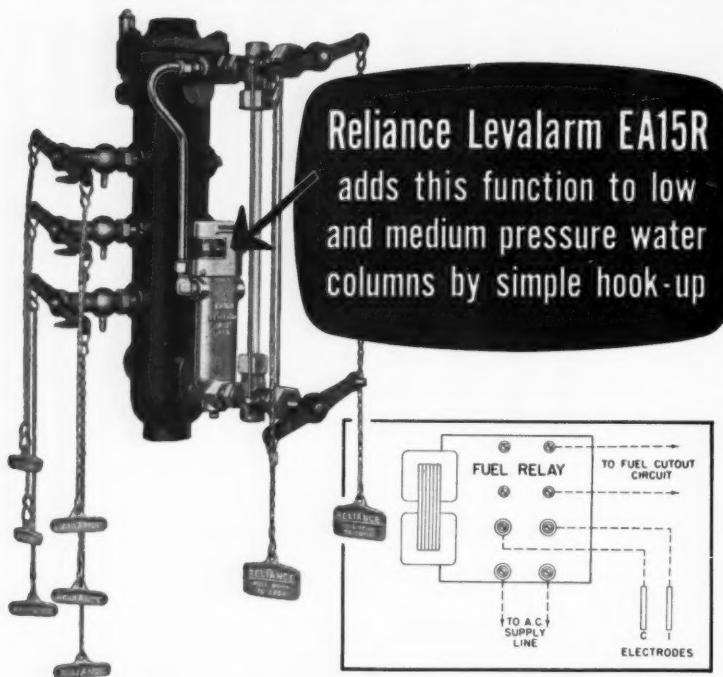
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Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe
(centrifugally cast in sand molds)

Install a fast-acting, positive fuel cut-out control at low cost



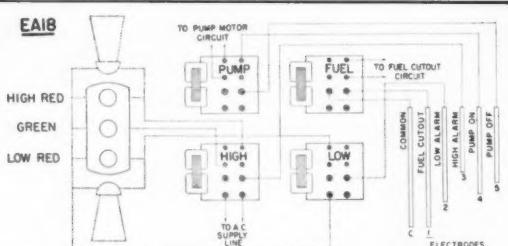
Two electrodes extend into boiler water in the Levalarm chamber. Water surrounding them completes a closed circuit carrying special current supply from a transformer. When water level drops below the electrodes, the relay circuit to the solenoid-operated fuel valve is broken. Action is immediate. An auxiliary alarm can be actuated at the same time. This Levalarm may be installed on any water column having gage centers not less than 12½"; maximum 450 psi. Very easy to install... Another model is designed for pressures to 900 psi.

Up to FIVE functions possible with other Levalarms

Broad protection for your boiler's safety can be realized through multiple-electrode Levalarm models that install in the water column cap. Model EA18 has enough electrodes to provide fuel cut-out, low and high water alarms, and start and stop feed pump. To comply with insurance company rulings requiring dual fuel cut-out facilities, an extra electrode can be added to the Levalarm. Thus no additional piping needed.

It will pay you to get details on Reliance Levalarms. Write for Bulletin D2 or contact nearest Reliance Representative.

The Reliance Gauge Column Company
5902 Carnegie Avenue • Cleveland 3, Ohio



Reliance
BOILER SAFETY DEVICES



delight you in *The Gentle Art of Mathematics*. The only requisites are a desire to know what modern mathematics is all about and a certain capacity for logical thought — which the author assures us is something almost everyone has.

If you happen to be the type who feels you must understand every idea explored here, you are likely to become a bit frustrated if you have forgotten some of the algebraic manipulations taught in your high school course. A thorough understanding can come only from verifying all the computations and mulling over all the arguments. The going could get a bit sticky in the chapter on automatic thinking if you have forgotten, for example, how to remove parentheses.

The majority of readers will have neither the time nor the patience for a thorough analysis of all the ideas suggested. Nevertheless, there is enough purely descriptive material in the book to entertain and to give some idea of the part that numbers play in our living.

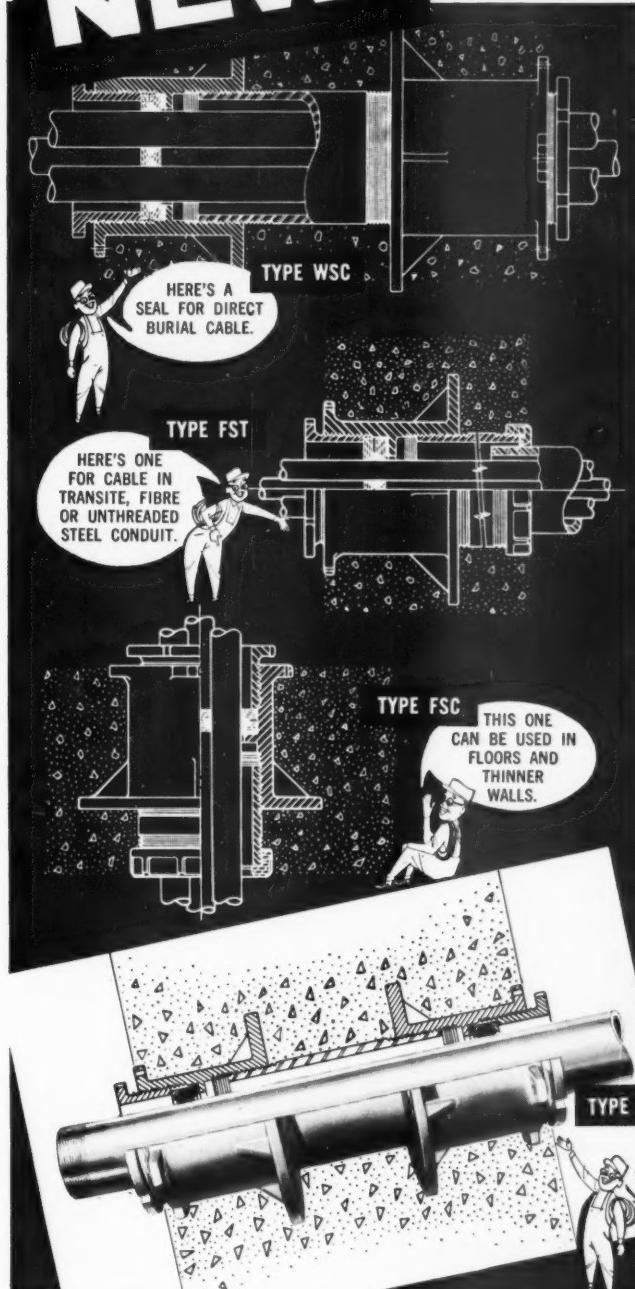
If you have a larcenous turn of mind, you can pay the light bill by memorizing the strategic positions in the game of Nim (as explained in this book), then enticing a well-heeled friend into a series of games. If you prefer to be more analytical, you can explore the binary decimal system and figure out the strategic positions as the game progresses.

For the show-off type, there is an explanation of the method used to remove the vest without first removing the jacket. This involves the principle of topology, and while it may not earn you a life-of-the-party reputation, it is less obnoxious than the lampshade-on-the-head routine.

We can strongly recommend this little volume for home consumption by all consulting engineers. It is obvious that Professor Dan Pedoe had fun writing it, and you will have fun reading it.

Dr. E. A. Maxwell, author of *Fallacies in Mathematics*, states in his

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Diatomite filtration of water in large volume is a comparatively recent development by Sparkler engineers. For many years the distinct superiority of diatomite filters in producing filtered water of highest clarity, with reduced bacteria count and with absolute uniform quality has been recognized by engineers in the chemical and other industrial fields, but old style diatomite filters were limited in volume.

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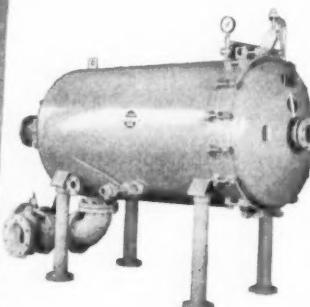
This new phase of water filtration is worthy of careful investigation and study by all consulting engineers who are engaged in large volume water filtration.

MODEL RJ

A closed tank, pressure filter, with self cleaning features. The spent diatomite cake is peeled off the plates with the exclusive Sparkler Hydro-Scraper knife edge pressure spray and is washed out of the tank through the sloping bottom drain. The complete cleaning operation including precoating and recirculating for clarity ready for resuming operation is less than 30 minutes; a completely new uncontaminated filter media is thus provided. Filter element and spray tubes have no metal to metal contact with tank, thus providing electrolytic protection. Fully automatic electronic operation can be furnished.

Capacities are available in a single unit for 1,500,000 gal. per 24 hr. operation.

Approximately $\frac{1}{4}$ the floor space is required by this filter as compared with a sand filter and the installed cost is $\frac{1}{2}$ to $\frac{2}{3}$ that of sand.



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A vacuum type filter that operates with an open tank and with full visibility of filtering process at all times. Plates are plugged into a self sealing outlet manifold at the bottom of the tank. Cake is removed by flushing off with hose. Spent cake flows out the self draining bottom through a T on the inlet supply pipe. Filter elements have no metal to metal contact with tank, thus eliminating electrolytic action.

This filter is available in capacities up to 900,000 gal. per 24 hr. operation.

Both filters have synthetic cloth covered plates that are removable without bolts or fastenings.



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preface that his aim is "to instruct through entertainment." We were not entertained, and hence not instructed. This is not entirely Dr. Maxwell's fault. A mathematician who had made a hobby of exploring mathematical fallacies would find this book just the ticket. The author considers a variety of fallacies in algebra, geometry, trigonometry, calculus, and several unmentionable branches of higher mathematics. He follows the fallacies through to their ridiculous conclusions. This is fascinating to the mathematician, but it may leave the average engineer lost.

The author disagrees, for he says "The standard of knowledge expected is quite elementary; anyone who has studied a little deductive geometry, algebra, trigonometry, and calculus for a few years should be able to follow most of the exposition with no trouble." If he is right, and we are wrong, then engineers will be "entertained and instructed." We hope that Dr. Maxwell is right.

Books Reviewed in This Issue

How to Combine the Tax Benefits of Both Corporations and Partnerships For Your Business, by Tax Research Institute, Inc.; \$12.00; Random House; New York, N. Y.

Maya, by Charles Gallenkamp; \$5.50; David McKay Co., Inc.; New York, N. Y.

Fallacies in Mathematics, by E. A. Maxwell; \$2.95; Cambridge University Press; New York, N. Y.

The Gentle Art of Mathematics, by Dan Pedoe; \$3.50; The Macmillan Co.; New York, N. Y.

To get your copy of these books, order through your local book store, or we will order the volumes for you at regular publishers' prices.

New Technical Books

A bibliography of 193 references on the design, development, and con-



LATEST IN COOLING Gas operated York machines feature the use of tap water as refrigerant and lithium bromide as absorbent, one of the most efficient, practical refrigeration cycles developed so far. Machines start and stop automatically.

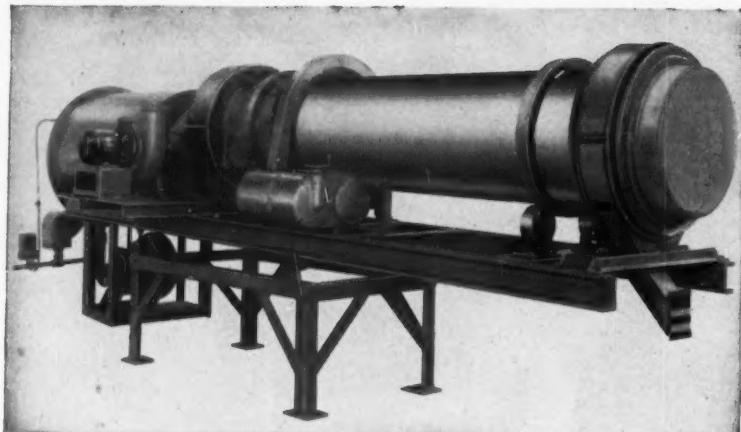
*"with **YORK**
GAS air conditioning
our boilers keep us cool
all summer"*

"With our boilers sized for a winter load, we were naturally oversized for the summer months. But York's gas-operated Lithium Bromide absorption water chillers permit us to make efficient use of part of this steam capacity to cool," says Mr. M. J. Mather, President of the Allen Manufacturing Company, makers of hex-socket screws.

The York Lithium Bromide system eliminates the need for huge compressors found in other types of cooling equipment . . . which brings down the original cost considerably. And with gas as the boiler fuel, you make year-round use of an otherwise wasted source of power *at rock bottom costs*. In addition, York machines are noiseless, lightweight, compact — easy to install and readily adaptable to almost any plant layout.

Find out how your present heating system can pay off for you all year 'round with gas-operated York automatic water chilling units. Call your local gas company or write to the York Corporation, Subsidiary of Borg-Warner Corporation, York, Pennsylvania. *American Gas Association*.





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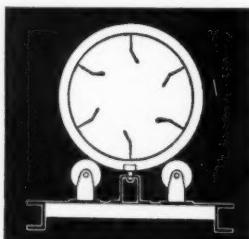
The Ruggles-Coles Pilot Plant Dryer is designed especially for laboratory use or for small capacity unit operations requiring a continuous or intermittent drying step. Each unit:

- Is mounted on a structural steel base.
- Has removable "knockers."
- Provides for easy changing of shell rotation speed or shell slope.
- Is available in stainless steel or other corrosion-resistant materials.
- Requires only fuel supply and power connections to be placed in operation.
- Is easily moved from place to place.

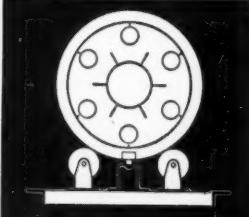
It is available in three models:

- (1) XH-XF single-shell, direct gas fired dryer. Arranged for either parallel or counter-flow operation. Bulletin AH-471.
- (2) XB double-shell, indirect-heat, gas-fired dryer for drying without contamination. Volatiles removed with only limited dilution. Bulletin AH-472.
- (3) XC steam-tube indirect heat dryer. Can be connected to any available steam supply or furnished with a 3-HP steam generator. Bulletin AH-473.

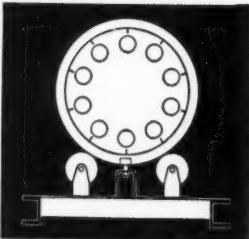
For complete information write Department 64.



XH-XF SINGLE-SHELL



XB DOUBLE-SHELL



XC STEAM TUBE

struction of the Shippingport pressurized water reactor has been compiled by the AEC. The publication, TID-3068 — *A Bibliography of Report Literature: The Shippingport Pressurized Water Reactor*, may be ordered from OTS, U. S. Department of Commerce, Washington 25, D. C. The document contains 44 pages; costs \$1.25. All reports listed are available from OTS.

FUNDAMENTAL ASPECTS OF REACTOR SHIELDING, by Herbert Goldstein; Addison-Wesley Publishing Company, Inc., Reading, Mass.; \$9.50. In most reactor installations, the shield is larger than the reactor core and the cost of design and construction of shielding always is a considerable fraction of the overall cost. This comprehensive book describes the present state of the art, relating both to the fundamental and generally applicable aspects of reactor shielding. A good, solid review of an important subject by a qualified authority.

GUM PLASTICS, by M. S. Thompson; Reinhold Publishing Corporation, N.Y.; \$4.50. This is the ninth book in a series describing the applications of rigid plastic materials and the reasons for their selection and use. It is intended as a reference for use by both designers and product engineers.

The author classifies the gum plastics into three groups; polystyrene, acrylonitrile-butadiene-styrene polymers (ABS), and polyvinyl chloride (PVC). After developing the general properties of these materials he goes on to discuss the basic chemistry of their manufacture, processing and fabricating, and application.

Seymour Schwartz, President
S. Schwartz & Associates

CONSTRUCTION ACCOUNTING AND FINANCIAL MANAGEMENT, by William E. Coombs; F. W. Dodge Corporation, N.Y.; \$12.85. Here is the first comprehensive accounting and financial management handbook for

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WhirlBlast DUAL-FUEL BURNER



FORCED DRAFT...no stack draft required
DUAL FUEL...gas or oil — instant changeover
CLEAN...no air pollution
PACKAGED...everything built-in, ready to go

New high in combustion efficiency and fuel economy

with this revolutionary burner for medium size boilers

This compact Iron Fireman WhirlBlast unit combines many of the advantages of big burners, yet it requires little more supervision than the oil or gas burner in your home.

No stack — no draft problems. Air supply is precisely controlled under all conditions. The WhirlBlast burner eliminates the need for a costly and unsightly smokestack, and also eliminates the noise, bulk and high power requirements of induced draft firing. This burner starts clean and burns clean, with no soot or smoke problems.

Steadiest flame ever developed. In the new WhirlBlast firing head Iron Fireman engineers have solved the persistent problem of flame pulsation. A clean, steady, efficient flame is achieved without firebox vents or any other makeshift device.

Fires gas or light oil; changes fuels instantly. Quick fuel changeover can be accomplished with the flick of a switch, or automatically with special controls. Models available for firing either gas or oil exclusively.

A true "package". When you bolt the WhirlBlast unit to the boiler front you install a complete forced draft firing system, combining air and fuel systems and integral electronic combustion controls. It leaves the factory as an operating unit, factory wired and tested. Does not require refractory combustion chamber, nor any provision for secondary air supply.

For all types of boilers. The WhirlBlast burner can be purchased in two ways: as a boiler-burner unit (shown at right), or as a burner alone for use in your present boiler.



Complete boiler-burner unit, ready to operate. Boiler and burner compose a single unit, engineered, assembled, wired and tested at the factory, carrying factory responsibility. Requires little more than service connections when delivered to the job. Sizes from 15 to 100 boiler horsepower.

Send for more information

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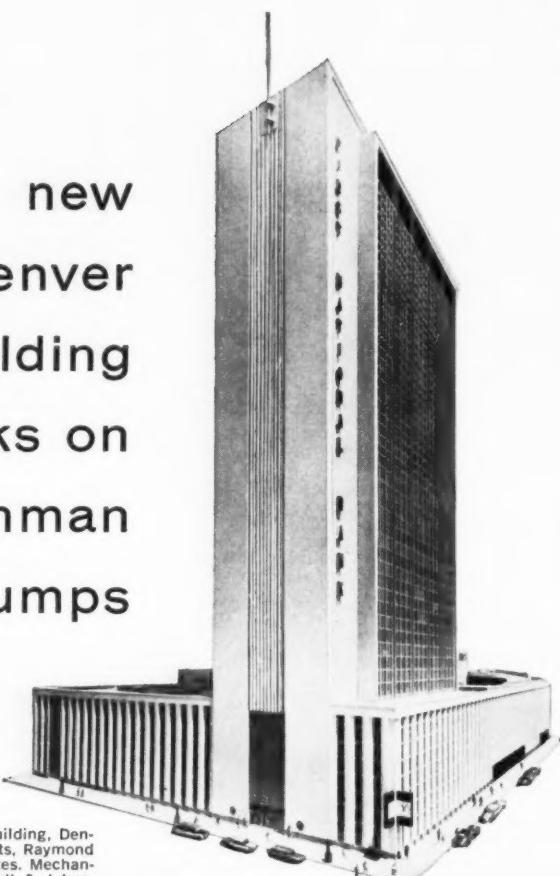


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3150 W. 106th Street, Cleveland 11, Ohio
(In Canada, 80 Ward Street, Toronto, Ontario)

Please send me more information and specifications on the Iron Fireman WhirlBlast burner.

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Firm _____
Address _____
City _____ Zone _____ State _____

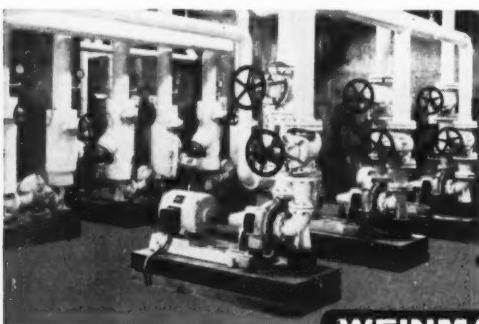
new
Denver
building
banks on
Weinman
pumps



First National Bank building, Denver, Colorado. Architects, Raymond Harry Ervin & Associates. Mechanical Engineers, Marshall & Johnson. General Contractors, Mead & Mount Construction Company. Mechanical Contractors, Natkin & Company. All are Denver firms.

When the air conditioning system for Denver's new First National Bank building was planned, efficiency and dependability were top considerations. That's why Weinman pumps were specified to handle condenser water and chilled water throughout the installation.

The dependable performance of Weinman pumps is well-known. Many important installations similar to this impressive bank building, attest to this fact. What you may not know is that Weinman pumps save you significant sums in original cost. It is well worth your while to call your Weinman Pump Specialist for complete information. (He's listed in the Yellow Pages.) Or, write us direct.



PUMPS EVERYWHERE—AND EACH ONE A WEINMAN. This is a corner of the sub-basement of the First National Bank building. The three Type 4KB-3B Weinman pumps in the foreground handle condenser water for the air conditioning system for Floors 1 through 16. Each pump has a capacity of 690 GPM against a 100' total head. Because of the high suction, pumps have special ribbed casings. In the rear, three Type 4L-3 Weinman pumps handle chilled water to cooling coils for cool air fans, Floors 1 through 16.

THE
WEINMAN PUMP
MFG. CO.
590 SPRUCE STREET
CENTRIFUGAL SPECIALISTS

the construction contractor. For consultants whose engineering activities are primarily in the construction field, it is a valuable reference manual.

Starting with basic operational and accounting patterns, the author progresses from the very small organization to the very large. However, the primary purpose is to assist the individual contractor who is seldom a trained accountant.

An important chapter is one dealing with subcontracting policies and procedures. With today's high degree of specialization, the subcontract becomes an increasingly complicated operation. It can make or break the prime contractor.

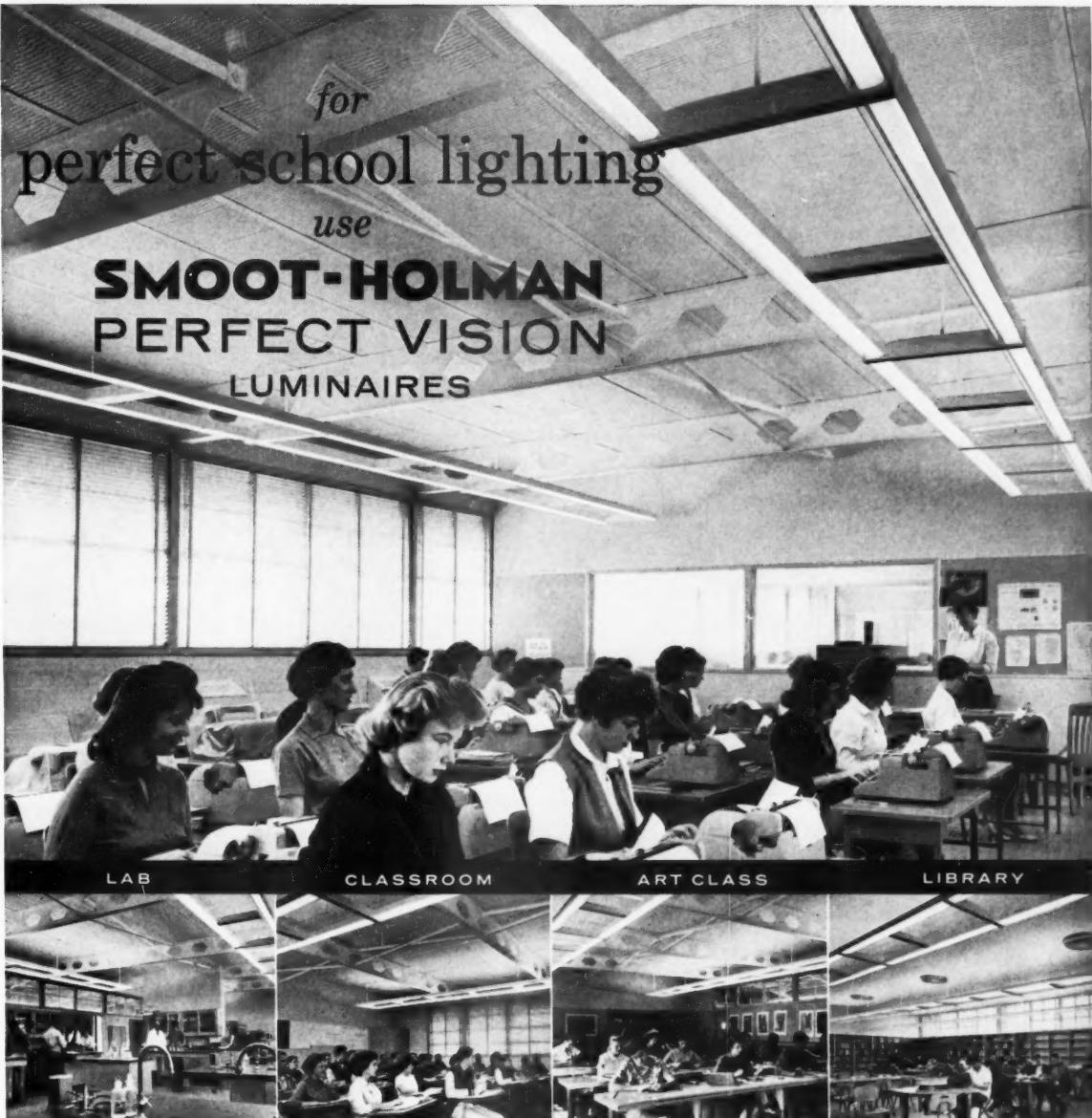
The text is amply fortified with actual procedures and sample forms presently in use by contracting firms. Consideration is given to all types of operation, from the simplest hand entry system to complex machine accounting.

*Reginald Arndt
Consulting Management
and Industrial Engineer*

THE PHYSICAL CHEMISTRY OF STEEL-MAKING, edited by John F. Elliott; the Technology Press of the Massachusetts Institute of Technology and John Wiley and Sons, Inc., N.Y., \$15. A compilation of the Proceedings of the Conference on the Physical Chemistry of Iron and Steelmaking sponsored by MIT, this volume includes 43 papers by worldwide leaders in the field of metallurgy. The contents are divided into nine sections, including liquid metals, equilibria of reaction in liquid iron and steel, behavior of metal oxides, solidification of castings and ingots, and similar topics. There is also a special report on kinetic problems in steelmaking.

*Karl Hellmann
Hellmann Associates*

SAMPLED-DATA CONTROL SYSTEMS, by Elisha I. Jury; John Wiley & Sons, Inc., N.Y.; \$16.00. Here is an authoritative treatment of the mathematical techniques required



Architects: Marsten & Weston • Consulting Engineers: Ralph E. Phillips, Inc. • Electrical Contractors: McGee Electric Co.

The above photos were taken at Ganesha High School, Pomona, California, and illustrate the excellent lighting furnished by Smoot-Holman fixtures. Winston Nelson, principal of Ganesha High School states, "The fixtures provide ample foot candle illumination spread evenly over each room. We have noticed an absence of flicker and ballast noise, and we are pleased with the easy maintenance of these fixtures." B. J. Triggs, of Ralph E. Phillips, states, "It has long been recognized that indirect lighting is ideal for close work because of its lack of glare reflections and shadows. However, to obtain higher intensities we have used direct lighting. It was not until the advent

of Smoot-Holman P-V series that we found it advantageous to use indirect lighting again. In this school we proved that in a typical classroom (28' x 45') using the 800 m. a. lamps in two rows of P-V fixtures we obtained practically the same illumination intensities as by using conventional 48" rapid start lamps in three rows of direct fixtures. Using only two-thirds of the lineal feet of fixtures and only two-thirds of the lighting outlets and light switches, we actually accomplished a considerable savings to the school board and gave them a better installation."

Send for free, informative brochure, "What You Should Know About School Lighting."

Scientifically designed lighting by **SMOOT-HOLMAN CO.**

321 N. Eucalyptus Ave., Inglewood, Calif.



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on the Moon...**

**SOILTEST
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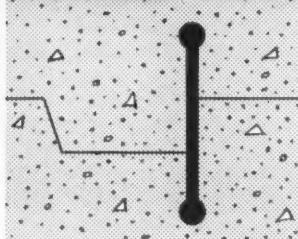
CONSTRUCTION on the moon! This idea made headlines recently—and who is to say "Not possible..."

So, since SOILTEST engineering testing equipment is now being used on Arctic icecaps, desert wastelands, steaming jungles, as well as in the most up to date university and professional testing laboratories in 105 countries around the world, it follows that when construction begins on the moon, moon soil samples will be tested first on SOILTEST apparatus.

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Williams Efficiency Waterstops are made from Natural Rubber Stock, and designed for maximum effectiveness in any type of cast-in-place construction joint. They will bend around corners—will not crack or tear from shear action. Tensile Test: 3990 lbs.; Elongation Test: 650%. Available in rolls up to 80 feet in length. Field splicing is simple. Williams Waterstops can also be furnished in Vinyl or Neoprene for industrial uses where resistance to oil and other injurious wastes is desirable. These highly effective Waterstops are now in use in hundreds of industrial plants, commercial and public buildings throughout the country.

See Sheets, or Write for Information.

WILLIAMS

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for the analysis and design of feedback control systems involving components whose inputs or outputs are discontinuous functions of time, such as data samplers, digital computers, hold circuits, and pulse moderators. The descriptive material is clear and concise, and the examples are numerous and well chosen.

Three key chapters deal with the development of the Z, modified Z, and P transform. These are essentially generalizations of the Laplace transform. The part they play in the theory of discontinuous control systems is similar to that played by the Laplace transform in studies of continuous series. Of interest to the design engineer are chapters devoted to development methods which can be used for the design of both discrete and continuous type compensators.

*Fred S. Roehrs
Flight Science Laboratory, Inc.*

COMPANY CLIMATE AND CREATIVITY, prepared by Deutsch & Shea, Inc.; Industrial Relations News, N.Y.; \$10.00. This is an easy reading summary of what is needed to develop the right climate for creativity, particularly in basic research. While many of the conclusions are self evident, they are developed thoroughly by experts from a variety of fields including education, industrial research and development, consulting engineering, and also marketing.

Emphasis is placed on the current trend toward conformity and

its deadening effect on creativity. An attempt then is made to set up standards for a mental, physical, and emotional climate conducive to creative thinking by both individuals and groups. Perhaps some of the ideas presented will help return the individual to a position of prominence in creative fields.

*David L. Narver, Jr.
Holmes & Narver, Inc.*

PLASTIC DESIGN IN STEEL, a design manual; American Institute of Steel Construction, Inc., N.Y.; \$4.00. Emphasis is placed on the practical aspects of designing one and two story continuous structures by engineers. There is a minimum of theory, mainly dealing with the equilibrium method for the design of continuous beams and single span, single story rigid frames as well as the mechanism method for use in the design of more complicated structures.

Formulas and charts are presented which allow extremely rapid design of continuous beams and single and multispan rigid frames. In addition, several sections in the text are devoted to various details such as column design, connections, lateral bracing, and unsymmetrical sections. All designs are in accordance with the AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, as well as the Supplementary Rules for Plastic Design and Fabrication, which received the full approval of AISC in December 1958.

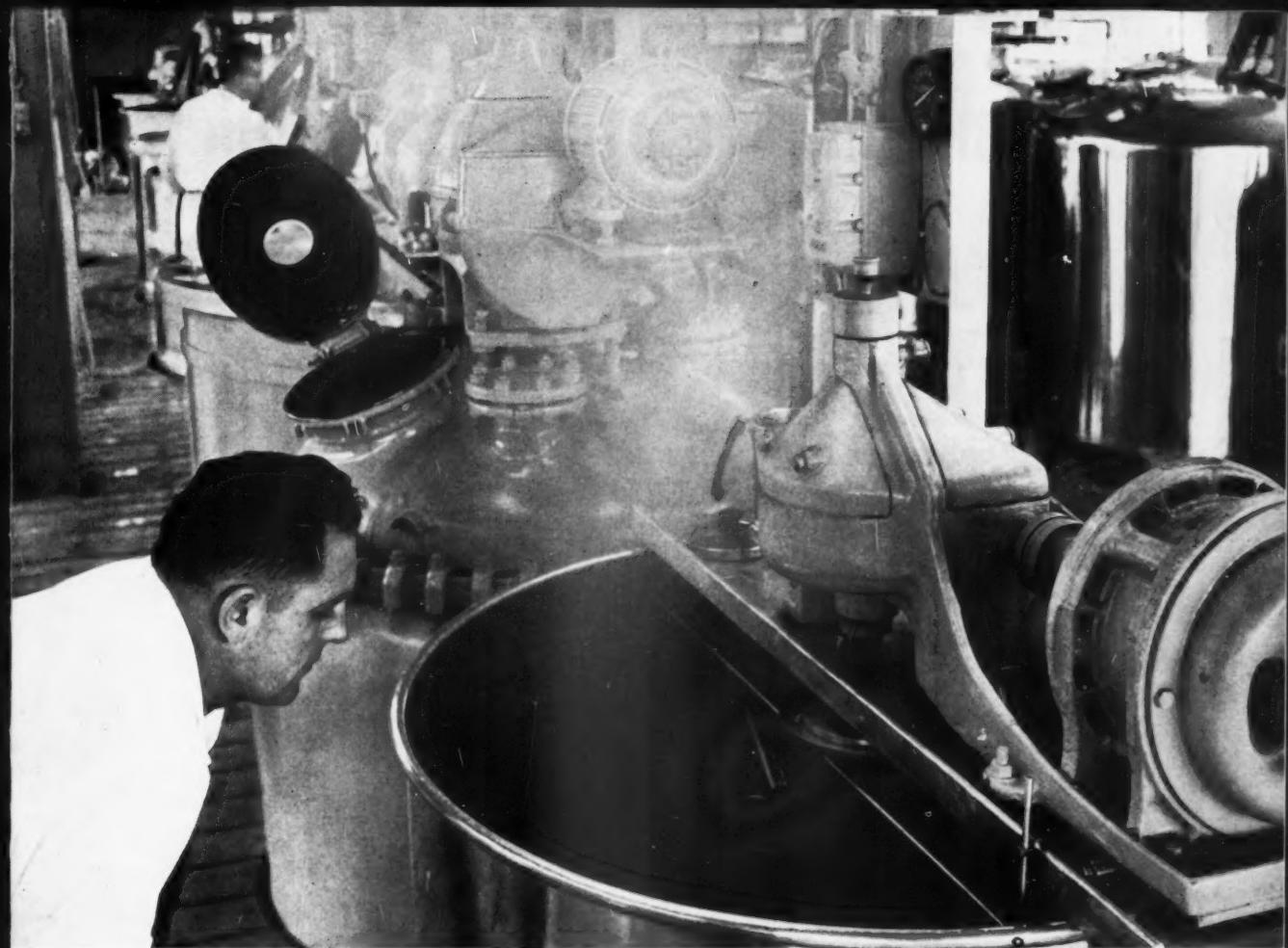
Pneumatic SEALS from the other *Goodyear perform 1001 feats

Need a pneumatic seal large enough to seal the shells of a wind tunnel? Or small enough to plug a pinhole? We, at Goodyear, manufacture pneumatic seals of every type and description—for every conceivable use and operating condition.

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*that's us... the original. Established 1872, we have no connection with the firm that makes auto tires.

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Steam Supply by B & W

Keeps Boiler Room Hospital-Clean at Hoffmann-La Roche Pharmaceutical Manufacturer Meets Expanded Needs In Small Space

Spotless housekeeping, important throughout a pharmaceutical plant, was extended to Hoffmann-La Roche's boiler room at Nutley, New Jersey, when two new B&W units were installed. The new boilers meet expanding plant needs in a small space. They also take wide load variations in stride—on less fuel. Steam plays a multiple role in processing this famous line of pharmaceuticals, and the B&W Boilers provide a dependable, low cost supply of clean, dry steam.

No matter how you use steam, for processing or only for heating; no mat-

ter how large or small your demand is, it will pay you to look at your steam costs. You'll be surprised how much money you're burning. And that's the money that really matters—not the initial cost of the boiler.

Most boilers consume their initial cost in fuel every year. During the normal life expectancy of many boilers, the fuel bill can amount to several million dollars. Unless it is well-engineered, well-serviced, and well-maintained, the efficiency of a boiler can drop off 2 or 3 per cent or even more.

This amounts to a substantial sum of money.

You save on your steam supply with B&W Boilers. That's why it pays to buy the best for your steam operations—B&W's top level engineering, long range sustained economy, and best performance. A national network of plants and engineers, supported by nearly a century of steam generating experience, is yours. Talk over your steam needs with B&W.

The Babcock & Wilcox Company,
Boiler Division, Barberton, Ohio.



B & W

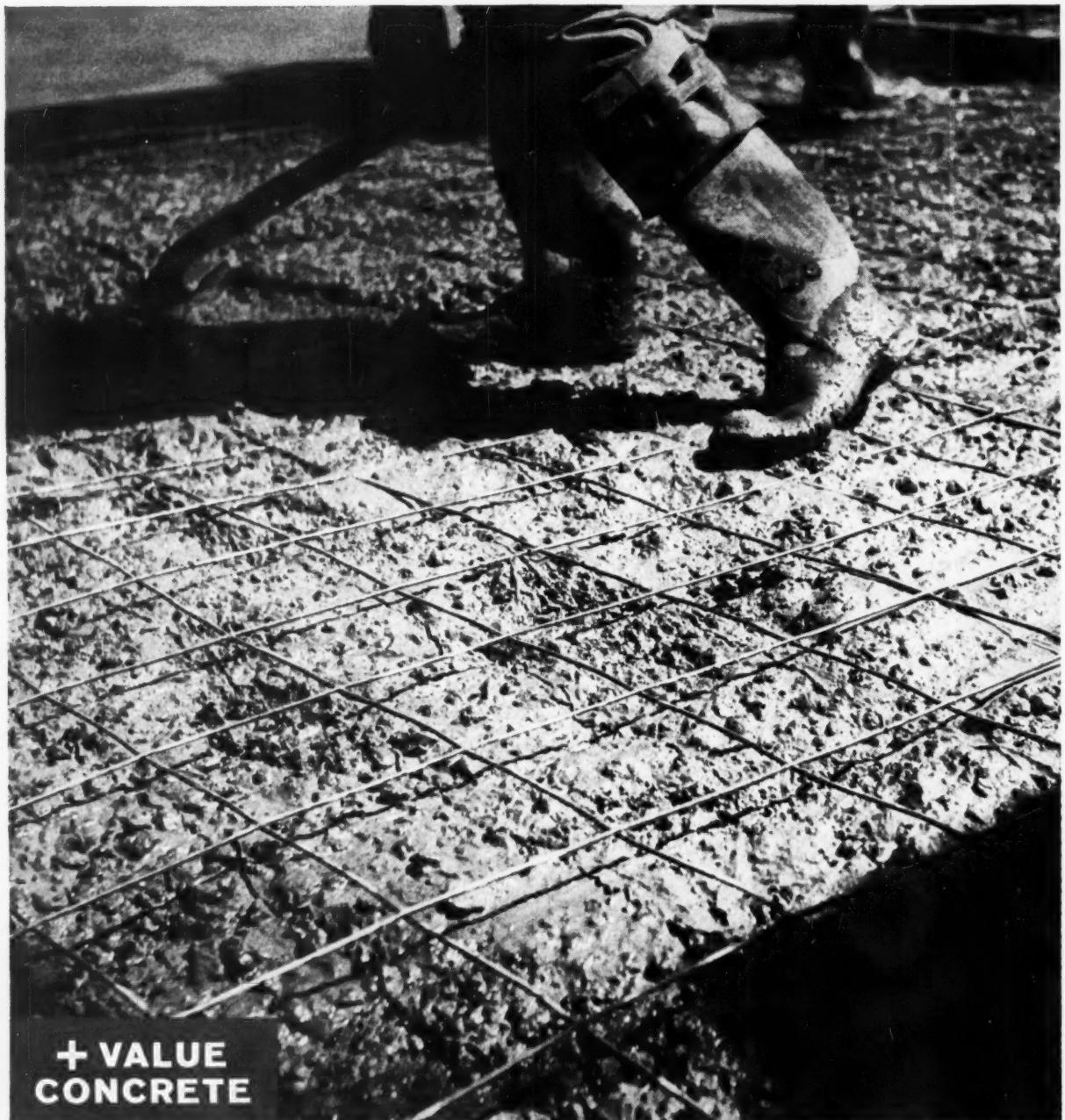
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THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

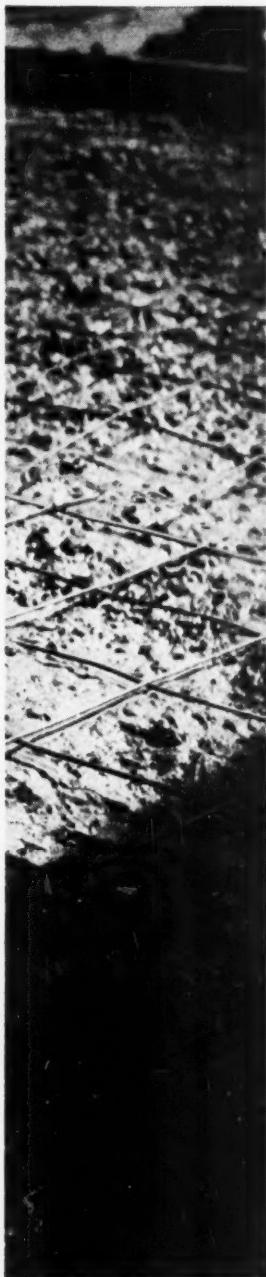
New, improved  American Welded

strength of 75,000 psi...and a



Wire Fabric has minimum tensile minimum yield point of 60,000 psi...

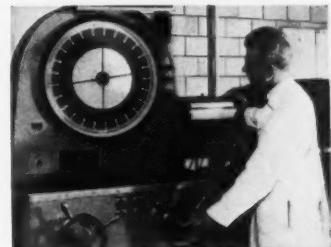
to give you a better,
stronger product at
no increase in cost!



For more than 50 years, USS American Welded Wire Fabric has been doing an outstanding job of reinforcing all kinds of concrete work—from porches and walks to skyscrapers and highways. And now—because of its greatly increased tensile and yield strength—it will give even greater strength, longer life, increased freedom from cracking and less maintenance. Also, it will permit longer joint spacing for reinforced slabs on ground or less steel if present joint spacing is used. The new improved Welded Wire fabric will have a 75,000 psi minimum ultimate tensile strength with a minimum yield point of 60,000 psi.

Closely controlled laboratory tests show that if the conventional bond stress theory is applied to American Welded Wire Fabric's resistance to slip, fantastically high bond stress values of from 1,000 psi to 2,700 psi are computed. (See ACI Proceedings, Vol. 48, April, 1952.) Continuing bond test research under the direction of American Iron & Steel Institute has shown such good mechanical anchorage in the concrete as to permit this increase in the Tensile Strength of Fabric. American Steel & Wire is able to present this new product because of the tested bond values which enable designers to take advantage of a higher fabric yield point.

Just one example of the advantages of this improved fabric is in one-way slabs. The ACI Building Code 318-56 will allow unit tensile strength for fabric in main reinforcement of 30,000 psi in one-way slabs of 12-foot span or less, provided reinforcing members are $\frac{3}{8}$ " or less. Previously, designers were limited to 28,000 psi working stress with fabric, and only 20,000 psi with intermediate grade bars.



The new Welded Wire Fabric will cost no more. It will come in the same prefabricated rolls or sheets for easy handling and placing. Therefore, to get the improved product on your job at no extra cost, be sure to specify USS American Welded Wire Fabric.

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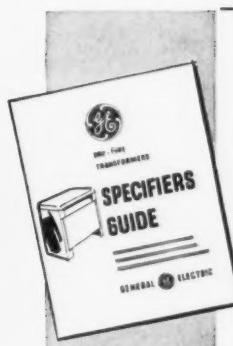
Don't take a chance on your specifications. Specify General Electric—you'll get the best without paying a premium, and you'll get a satisfied customer.

For complete product information on this new line of dry-type transformers contact your local General Electric Distributor or Apparatus Sales Office. Section 412-11, General Electric Company, Schenectady 5, New York.

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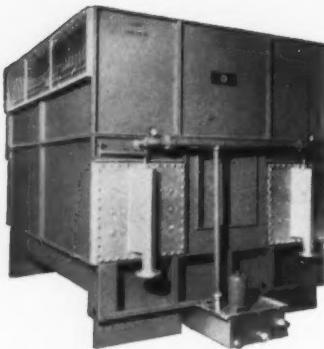
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ARIZONA

Coe & Van Loo

Yuma, Arizona

¶ Development of private irrigation project, including flood protection, water supply, canal system, and the necessary land leveling. (struc., civil) \$1.6 million. Client, Bruce Church, Inc.

¶ Preliminary design of drainage system, including concrete lined conveyance channels, pumping plants, siphons, flumes, and bridges. (struc., civil) \$14 million (est.) Client, Welton-Mohawk Irrigation District.

¶ Flood protective works, Gila River channelization, dikes, and jetties. (struc., civil) \$75,000. Client, Welton-Mohawk Irrigation District.

¶ Underground pipeline irrigation system. (struc., civil) \$75,000. Client, Curtis, Woodman & Roach.

CALIFORNIA

R. E. Layton & Associates

San Leandro, California

¶ Second stage of small craft harbor and marina. Mooring for 400 small craft. (civil, struc., mech., elec.) \$1.5 million. Client, City of San Leandro, California.

¶ Consulting services on water supply system. (civil) Client, City of Petaluma, California.

Golden, Bryant & Jehle

El Centro, California

¶ Agriculture building, El Centro, California. (struc., civil, mech., elec.) \$100,000. Client, Central Union High School District.

¶ Public health center, El Centro, California. (struc., civil, mech., elec.) \$300,000. Client, Imperial County.

¶ Elementary schools, El Centro, California. (struc., civil, mech., elec.) \$600,000. Client, El Centro School District.

¶ Imperial Yacht & Ski Club, Salton Sea, California. (struc., civil, mech., elec.)

\$300,000. Client, Imperial Yacht & Ski Club, Inc.

¶ Ice plant, Salinas, California. (struc., civil, mech., elec.) \$500,000. Client, Salinas Valley Vegetable Exchange.

John R. Anderson, Structural Engineer

Pasadena, California

¶ Thunderbird Lanes, 34,000 sq ft concrete block building with wood roof framing, plywood sheathing, composition roofing, steel trusses (122-ft span). 36-lane bowling alley, Ontario, California. (struc., civil) \$280,000. Client, William Wong, architect.

¶ Office and warehouse building for Keystone Camera Corporation. 6500 sq ft brick building with composition roofing, plywood sheathing, wood roof framing, glued laminated beams. Grand Central Industrial Centre, Glendale, California. (struc., civil) \$57,000. Client, Grand Central Industrial Centre.

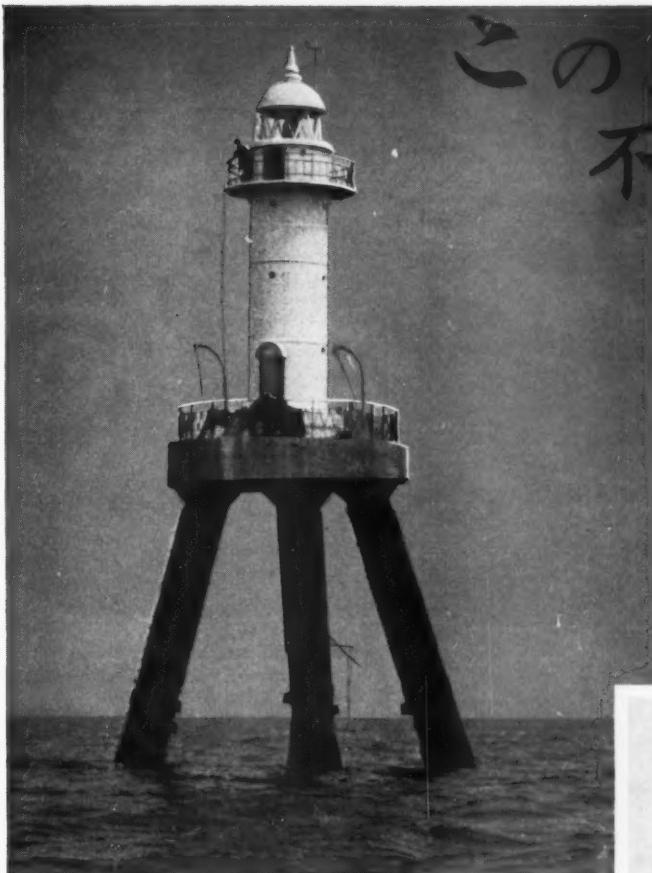
¶ Office and warehouse building, 20,000 sq ft precast concrete tilt-up building with composition roofing, plywood sheathing, wood roof framing, tapered steel girders. Whittier, California. (struc., civil) \$55,000. Client, R. F. Kelly and M. DiPeppino, owners.

¶ Building for lease. 18,000 sq ft precast concrete tilt-up building with composition roofing, plywood sheathing, wood roof framing, tapered steel girders. Grand Central Industrial Centre, Glendale, California. (struc., civil) \$54,000. Client, Grand Central Industrial Centre.

¶ Building for lease. 15,000 sq ft precast concrete tilt-up building with composition roofing, plywood sheathing, wood roof framing, tapered steel girders. Grand Central Industrial Centre, Glendale, California. (struc., civil) \$45,000. Client, Grand Central Industrial Centre.

¶ Office and warehouse building for Pacific Hawaiian Punch Corporation. Structural design calculations for 60,000 sq ft precast concrete tilt-up building with composition roofing, plywood sheathing,

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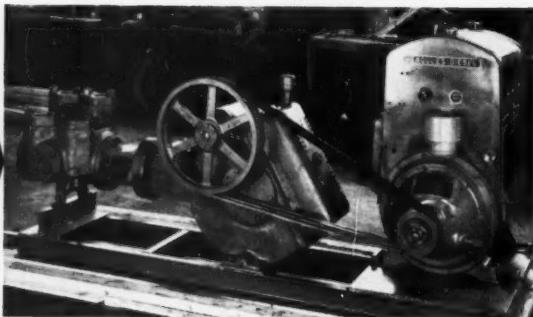
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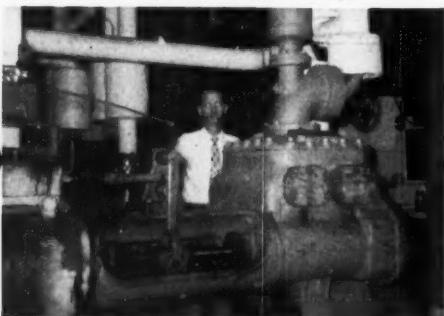
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wood roof framing, glued laminated roof beams. Partial basement and refrigeration and freezer rooms. Fullerton, California. (struc., civil) \$200,000. Client, Facility Engineering, Ltd.

¶ Retail store building—leasee, Sears-Roebuck Company. 30-ft x 85-ft masonry building with composition roofing, plywood sheathing, wood rafters, steel wide-flange beams. Twenty-Nine Palms, California. (struc., civil) \$15,000. Client, Eugene W. Theis, owner.

COLORADO

Paul K. Gerhardt, P.E.

Union City, New Jersey

¶ Congregational Emanuel, Denver, Colorado. New sanctuary. (struc., civil) \$600,000. Client, P. Goodman architect.

Fulton & Cramer

Lincoln, Nebraska

¶ Study of electrical plant, Springfield, Colorado. (mech., elec.) \$200,000. Client, Town of Springfield.

FLORIDA

U. D. Gosselin

Ocala, Florida

¶ Alterations to Commercial Bank & Trust Company, Ocala, Florida. (supervision of construction) \$84,000. Client, Commercial Bank.

¶ Citrus and gift building, Floral City, Florida. (struc.) \$32,000. Client, Robert Bittner, architect.

LOUISIANA

I. A. Naman & Associates

Houston, Texas

¶ Supermarket, New Orleans, Louisiana. (mech., elec.) \$275,000. Client, Curtis & Davis, architects.

Fred Kull, Consulting Engineer

West Monroe, Louisiana

¶ Sicily Island High School, Sicily Island, Louisiana. Four classrooms, library, and science room clustered around a gymnasium. Walls, one operation masonry (11¾-in. wide brick); roofs, concrete beam and slab over classrooms, concrete arches over gym. (mech., elec.) \$160,000. Client, Paul Stewart, architect, Monroe, Louisiana.

¶ Recreation building for Frostcraft Division, Olin Mathieson Corporation, West Monroe, Louisiana. Lounge, men's activity room, cafeteria, restaurant, barbershop, 30 tons air conditioning, masonry cavity walls (face brick and hollow tile, plastered), suspended acoustical ceiling on bar joists, built-up roof. (mech., elec.) \$100,000. Client, Beuford Jacka, architect, West Monroe, Louisiana.

¶ West Ouachita Memorial Hospital, West Monroe, Louisiana. Four-story, 106-bed lying in hospital with all latest facilities. Concrete structure, beam and slab, with metal curtain walls. High pressure double duct air conditioning system and oxygen, nitrogen, and closed TV systems contemplated. Joint venture with

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Charles Woodruff & Associates, Baton Rouge, La. (mech., elec.) \$1.6 million. Client, Beuford Jacka, architect, West Monroe, Louisiana.

MARYLAND

Alexander E. Forrest and Maryland Surveying & Engineering Co., Baltimore, Maryland. ¶ Aluminum footbridge (two spans) over Northern Parkway. (struc., civil) \$100,-000 (est.) Client, City of Baltimore, Maryland.

MASSACHUSETTS

Arthur S. Hamilton, Jr., Rochester, New York. ¶ Lighting of racetrack for night racing—new main substation, new distribution, relighting existing buildings. (struc., mech., elec.) \$550,000. Client, Eastern Racing Association, Inc. (Suffolk Downs), Boston, Massachusetts.

MISSISSIPPI

James H. Hancock, Consulting Engineer, Cordova, Tennessee. ¶ One-story, 100,000 sq ft tilt-up factory building for Futorian-Stratford Furniture Corp., Okolona, Mississippi. (struc.) \$440,000. Client, Mac Feemster, architect, Tupelo, Miss.

MISSOURI

Uri Seiden and Associates, Kansas City, Missouri. ¶ Memphis School, Memphis, Missouri. One-story grade school and multi-purpose room. Steel framing (struc.) \$350,000. Client, V. Preston Terrell, architect. ¶ Laquey School, Laquey, Missouri. Grade school addition, masonry bearing walls, wood roof. (struc.) \$50,000. Client, Frangkiser & Hutchens, architects. ¶ Elementary school addition and remodel high school, McDonald County, Anderson, Missouri. Grade school addition with multi-purpose room, steel framing. (struc.) \$87,000. Client, Frangkiser & Hutchens, architects.

¶ Elementary school addition, Buchanan County, Rushville, Missouri. Grade school addition, steel framing. (struc.) \$100,000. Client, Frangkiser & Hutchens, arch. ¶ DeKalb School, DeKalb, Missouri, gymnasium and two-story classroom addition, steel framing, precast concrete floors. (struc.) \$250,000. Client, Frangkiser & Hutchens, architects.

¶ Grade school addition, masonry bearing walls, wood roof, Goodman, Missouri. (struc.) \$65,000. Client, Frangkiser & Hutchens, architects.

¶ Grade school addition, steel framing, Maries County, Vienna, Missouri. (struc.) \$75,000. Client, Frangkiser & Hutchens, architects.

¶ A Maximite elementary school, Newton County, Stella, Missouri. One-story grade school, patented layout, wall bearing on grade beams. (struc.) \$156,000. Client, Frangkiser & Hutchens, architects.

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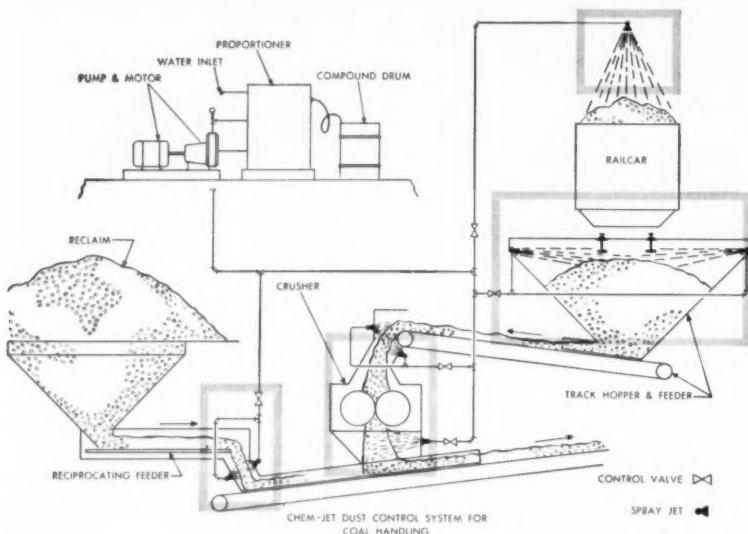
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MONTANA

T. T. Heberly, Electrical Engineer

Havre, Montana

¶ Design and construction of 17 miles of 69-kv transmission line. (elec.) \$62,000. Client, Hill County Electric Coop., Inc., Havre, Montana.

¶ Long range study. (elec.) Client, Sun River Electric Coop., Inc., Fairfield, Montana.

NEBRASKA

Fulton & Cramer

Lincoln, Nebraska

¶ Sewerage system, Village of Waco, Nebraska. (civil) \$50,000. Client, Village of Waco, Nebraska.

NEW JERSEY

Michael M. Burris

Englewood, New Jersey

¶ Morristown, New Jersey, public housing (56 units) (civil) \$800,000. Client, Kelly & Gruzen, architects.

¶ Bridgeton, New Jersey, public housing (100 units) (civil) \$1.6 million. Client, Barnett Singer, architect.

¶ Drainage design, Caldwell-West Caldwell, New Jersey high school. (civil) \$2.9 million. Client, Micklewright & Mountford, architects.

¶ Plainfield, New Jersey, public housing (100 plus units) (civil) \$1.5 million. Client, E. R. Brown, architect.

¶ Highland Park, New Jersey, public housing (24 units) (civil) \$320,000. Client, Woerner & Woerner, architects.

¶ Hudson Hills Homes, Englewood Cliffs, N. J. (19 lots) (civil) \$575,000. Client, Hudson Hills Homes, Inc.

¶ Office and warehouse, Scholastic Publishing Co., Englewood Cliffs, New Jersey, (survey) \$500,000. Client, Publishers Service, Inc.

¶ West New York Public Housing for the Aged, New Jersey. (civil) \$300,000. Client, Ricker & Axt, architects.

¶ W. Smith residence, Tenafly, New Jersey. (landscape architect and surveying) \$60,000. Client, owner.

¶ P. Chagaris residence, Tenafly, New Jersey. (landscape architect and surveying) \$60,000. Client, owner.

¶ New Dover and Woodbridge schools, Middlesex County, New Jersey. (civil) \$800,000. Client, Boyken & Moss, arch.

¶ Oakwood Forest, Section VIII, Englewood Cliffs, New Jersey (7 lots) (civil) \$215,000. Client, Oakwood Forest, Inc.

¶ East Hill, Section VI, Englewood Cliffs, New Jersey (39 lots) (civil) \$1,460,000. Client, Slater & Geiger.

¶ North Woodland Estates, Englewood, New Jersey (20 lots) (civil) \$1 million. Client, J. Cosden.

¶ Fort Lee public housing (600 plus units) (civil) \$9 million. Client, Kelly & Gruzen, architects.

Arthur H. Bronk

Little Falls, New Jersey

¶ New church, Richfield Christian Reformed Church, Clifton, New Jersey.



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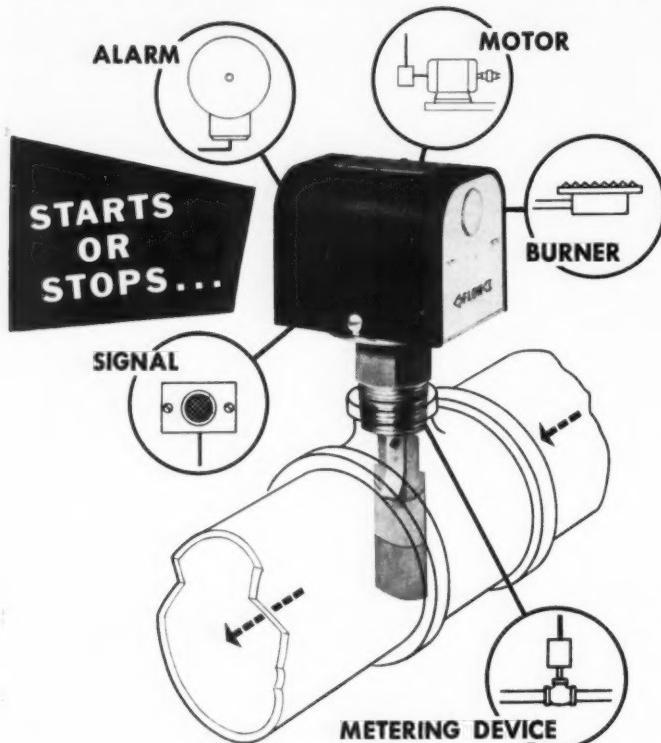
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(mech., elec.) \$175,000. Client, Solstad & Meyer, architects.

¶ Educational building, St. Peter's Lutheran Church, North Plainfield, New Jersey. (mech., elec.) \$65,000. Client, Solstad & Meyer, arch.

¶ Municipal building, Dover, New Jersey. (heating, ventilating, plumbing, elec.) \$400,000. Client, Edward A. Berg, arch.

Paul K. Gerhardt, P.E.

Union City, New Jersey

¶ Nesson Alloys, Inc., West Caldwell, New Jersey. One-story factory. (struc., civil, mech., elec.) \$450,000. Client, Aguado & Gross, architect & engineers, Philadelphia.

¶ St. Aloysius new convent and rectory, Caldwell, New Jersey, 2-story building. (struc., civil, mech., elec.) \$500,000. Client, A. J. DePace, architect, New York City.

¶ Hudson County News, 2-story factory, North Bergen, New Jersey. (struc., civil, mech., elec.) \$175,000. Client, Charles G. Eichholz, architect, Union City, N.J.

¶ One-story factory and dye house for Z-B Yarns, Inc., West New York, New Jersey. (struc., civil, mech., elec.) \$75,000. Client, Charles Binda, architect, Union City, N.J.

Henry J. Campbell, Jr., P.E.

Mineola, New York

¶ First Presbyterian Church, Asbury Park, New Jersey. Addition to existing building and Sunday school and administration wing with provisions for future church and fellowship hall. (mech., elec.) Client, Merrill & Holmgren, arch.

NEW MEXICO

Fred J. Fricke, Structural Engineer
Albuquerque, New Mexico

¶ Bank of New Mexico, Albuquerque, New Mexico. 15-story bank and office building. (struc.) \$2 million. Client, W. C. Kruger & Associates, architects.

NEW YORK

Charles M. Shapiro, P.E.
Brooklyn, New York

¶ One-story factory, 3400 sq ft, with provisions for second floor, Queens, New York. (struc., civil, mech.) \$35,000. Client, Berger Glass Works.

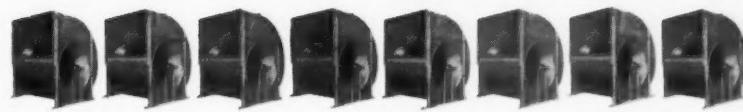
Henry J. Campbell, Jr., P.E.
Mineola, New York

¶ North Bellmore Fire District, North Bellmore, New York. New maintenance and control building. (mech., elec.) Client, W. Thomas Schaardt, architect.

¶ National Biscuit Company, Oakdale, New York. New warehouse and distribution center and sales office. (mech., elec.) Client, Carl B. Stoye, architect.

¶ Edmonton Gardens, Section 2, Babylon, New York. New garden apartments, five buildings with a total of 90 apartments. (mech., elec.) Client, Harold Nosow, architect.

¶ Sweet Hollow Presbyterian Church, Melville, New York. Fellowship hall,



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BEST-TE



sunday school, and administrative areas with provisions for future expansion and parking fields. (mech., elec.) Client, Ryder, Struppman & Neumann, arch.

NORTH CAROLINA

William F. Freeman, Inc.

High Point, North Carolina
¶ Raw water lines. (civil) \$350,000. Client, City of High Point, N.C.

¶ Water and sewer line extensions. (civil) \$265,000. Client, City of High Point, N.C.

¶ Water treatment plant additions. (struc., civil, mech., elec.) \$90,000. Client, Oakdale Cotton Mills.

¶ Sewage treatment plant, outfalls, pumping stations. (struc., civil, mech., elec.) \$1.2 million. Client, Town of Morehead City, N.C.

¶ New country club building and facilities. (struc., mech., elec.) \$300,000. Client, Emerywood Country Club.

The Harwood Beebe Company

Spartanburg, South Carolina
¶ Sewage treatment plant and outfalls. (struc., civil, mech.) \$750,000. Client, City of Hendersonville, N.C.

¶ Sewage treatment plant and outfalls lines. (struc., civil, mech.) \$700,000. Client, City of Forest City, N.C.

OHIO

Russell S. Fling

Columbus, Ohio
¶ Nine-story addition to Ohio National Bank, Columbus, Ohio. (struc.) \$1 million. Client, Sims, Cornelius & Scholey.
¶ Ohio Rehabilitation Center facility, The Ohio State University, Columbus, Ohio. (struc.) \$1.1 million. Client, Dan A. Carmichael.

¶ Turkey Run Village housing project. (struc.) \$2.5 million. Client, Brown, Brubaker & Brandt.

¶ Ohio Fuel Gas Company building, Wooster, Ohio. (struc.) \$600,000. Client, L. F. Karlberger.

Theodore Redner, Engineer

Northfield, Ohio
¶ Apple Creek State Hospital, dormitory bldg., Apple Creek, Ohio. (mech.) \$687,-567. Client, Trefon Sagadencky, arch.
¶ Apple Creek State Hospital, rehabilitation building, Apple Creek, Ohio. (mech.) \$615,498. Client, Trefon Sagadencky, architect.

¶ Akron Baptist Temple, sunday school addition, Akron, Ohio. (mech.) \$357,-566. Client, Trefon Sagadencky, arch.

Clauer Associates

Wooster, Ohio
¶ Office building, Wooster, Ohio. One-story and basement, 24-ft x 40-ft, concrete block and brick, reinforced concrete and wood framing. (struc., civil, mech., elec.) \$18,000. Client, Steiner Oil Company.

¶ Fire station and village hall, Seville, Ohio. One-story and basement, 40-ft x 80-ft, concrete block and brick, wood

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inventories

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Schaub's continuous boiler blowdown and sampling system helps produce significant boiler room savings. With each operation performed exactly as it should be, when it should be, with no water lost in overflushing or overcooling, reduced costs can be anticipated. Thermal recovery is constant and at a high level. Mantine requirements are less. Space requirements are reduced. This Schaub Automatic Console System needs only field service connections to put it into full operation. Several man-weeks of design time, plumbing, steam fitting and wiring are eliminated.

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framing, steel longspan and metal deck. (struc., civil, mech., elec.) \$38,200. Client, Village of Seville, Ohio.

¶ Floodlighting system, William F. Miller Field, Wooster, Ohio. (elec.) \$12,000. Client, Freedlander Foundation, Wooster.

Gustave M. Goldsmith

Cincinnati, Ohio

¶ New store front and remodeling. (struc.) \$75,000. Client, Batsakes, Cincinnati, Ohio.

PENNSYLVANIA

Paul K. Gerhardt, P.E.

Union City, New Jersey

¶ Temple Emanuel, Pittsburgh, Pennsylvania. New temple. (struc., civil) \$600,000. Client, Percival Goodman, arch.

Eugene J. Aufiero

Harrisburg, Pennsylvania

¶ Adams County Home for the Aged, Gettysburg, Pennsylvania. One-story, steel joist roof construction, with masonry bearing walls. (struc.) \$1 million. Client, Starr & Long, architects.

¶ Unity Lodge #71, I.B.P.O.E.W., Harrisburg, Pennsylvania. Two-story, steel joist roof and floor construction, with masonry bearing walls. (struc.) \$75,000. Client, Ralph E. Spahr, architect.

¶ Addition to food storage warehouse for wholesale grocer, Harrisburg, Pennsylvania. One-story, steel frame, with steel truss roof construction and masonry curtain wall. (struc.) \$125,000. Client, Starr & Long, architects.

SOUTH CAROLINA

The Harwood Beebe Company

Spartanburg, South Carolina

¶ Sewage treatment plant. (struc., civil, mech.) \$300,000. Client, City of Gaffney, S.C.

¶ Improvements to existing sewage treatment plant, outfalls, and collection lines. (struc., civil, mech.) \$500,000. Client, City of Darlington, S.C.

William F. Freeman, Inc.

High Point, North Carolina

¶ Sewage treatment plant, pumping stations, and interceptor outfalls. (struc., civil, mech., elec.) \$800,000. Client, Town of Beaufort, S.C.

TENNESSEE

Ebert & Park

Pittsburgh, Pennsylvania

¶ Library, Milligan College, Johnson City, Tennessee. (mech.) \$600,000. Client, Hoffman & Crompton, architects.

William F. Appleton

Kingsport, Tennessee

¶ Booker T. Washington colored elementary school, Jonesboro, Tennessee. New heating plant to replace original system; changing from hot air to steam. (mech.) Client, Beeson & Beeson, arch.

¶ East Side elementary school, Elizabethton, Tennessee. Classroom and library

► Dallas' NEW SOUTHLAND CENTER

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12,000 kva
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Served by six Wagner Underground Network

Transformers Dallas' fabulous new Southland Center consists of the 42-story Southland Life Tower, tallest building west of the Mississippi, and the 600-room Sheraton-Dallas Hotel. A "City within a City," the Southland Center is an enormous consumer of electric power. For example, there is a 6,450 ton electrically-driven air conditioning system—fourth largest in the world!

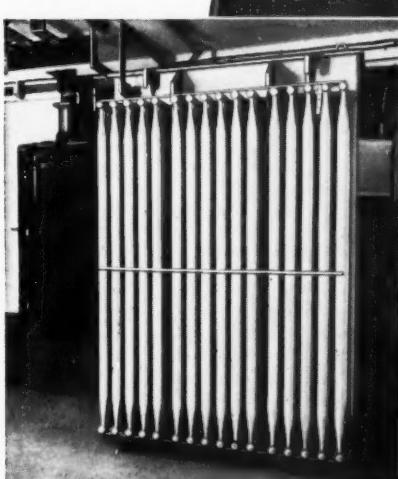
Dallas Power and Light Company, who supplies this power, has installed six 2,000 kva underground network transformers in the basement of the building to assure continuous electrical service to the Center. The transformers were supplied by Wagner.

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wiring . . . 15,800
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Sound installation by Tape Recording Industries

The new Men's Intramural Athletic Building at Michigan State University is one of the most modern athletic plants in the country. Its wide range of facilities requires the most versatile, flexible sound communication system possible.

An "SS-800" System by Stromberg-Carlson was selected to meet the needs of an athletic plant that boasts indoor and outdoor Olympic-size swimming pools; two huge arenas (16,000 square feet) where football and baseball teams practice; three large gymnasiums; nine handball courts; offices, classrooms and many locker rooms.

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separate systems serving the various areas. A master console can turn on power, page through any of the eight systems and reach any individual room or area.

The Stromberg-Carlson system doing this big job was "custom-engineered" from standard components. This efficient, economical method of design will meet your needs in all types of construction.

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STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**

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addition. (civil, mech., elec.) \$85,000.
Client, Beeson & Beeson, architects.

Reese & Jackson

Nashville, Tennessee

¶ Radnor sewer plant and outfall. (struc., civil, mech., elec.) \$350,000.
¶ Radnor water mains. (struc., civil, mech., elec.) \$200,000.

¶ Woodbine Homes, Inc. water system. (struc., civil, mech., elec.) \$200,000.
¶ Cattle barns, Tennessee State Fair. (struc., civil, mech., elec.) \$500,000.

¶ Nashville and Davidson county armory. (struc., civil, mech., elec.) \$600,000.

Walter F. Stuart

Nashville, Tennessee

¶ Pennington Bend (Two Rivers) high school, Donelson, Tennessee. (mech.) \$680,000. Client, F. B. Warfield & Associates, architects.

¶ Byrdstown high school. (mech.) \$500,000. Client, Morton, Carter & Associates, architects.

TEXAS

I. A. Naman & Associates

Houston, Texas

¶ Dormitory and classroom buildings for College of Nursing, Texas Women's University, Texas Medical Center, Houston, Texas. (mech., elec.) \$1.4 million. Client, J. Freeman, Jr., architect.

¶ Institute of Religious, Texas Medical Center, Houston, Texas. (mech., elec.) \$1.5 million. Client, J. Freeman, Jr., architect.

Frank W. Chappell

Dallas, Texas

¶ Federal courthouse and office building, Dallas, Texas (in association with William L. Cobb). (struc.) \$20 million. Mechanical and electrical engineers, Zumwalt & Vinther. Architects, Mark Lemmon and George L. Dahl.

¶ Rehabilitation center, Dallas, Texas. (struc.) \$1 million. Mechanical and electrical engineer, Leo L. Landauer. Architect, Howard R. Meyer.

¶ Addition to bank office building of Wichita National Bank, Wichita Falls, Texas. (struc.) \$1.5 million. Architect, George L. Dahl.

George J. Schaumburg

Beaumont, Texas

¶ Voth-Rosedale water and sewer improvements. (civil) \$2.1 million. Client, City of Beaumont, Texas.

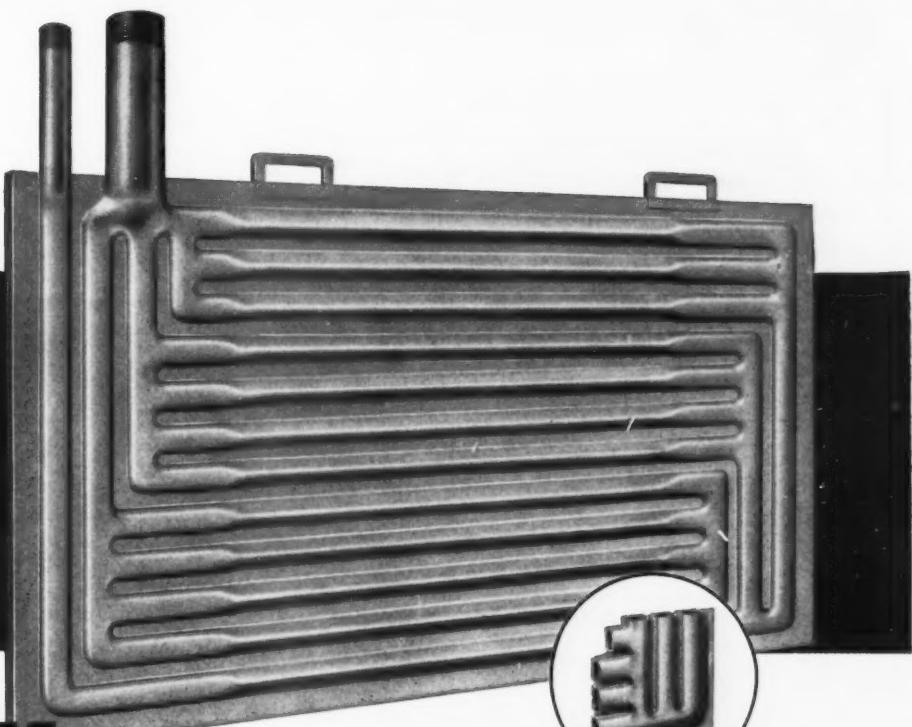
¶ Waterworks improvement program (1956). (civil) \$6,675,000. Client, City of Beaumont, Texas.

¶ Suburban Acres addition to City of Beaumont, Texas, street paving, storm and sanitary sewers, water lines. (civil) \$850,000. Client, Suburban Acres, Inc.

¶ Westgate addition to Beaumont, Texas, street paving, storm and sanitary sewers, water lines. (civil) \$1.5 million. Client, West Beaumont Development Co. and West End Development Co.

¶ Westfield Terrace addition to City of Beaumont, Texas, street paving, storm

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TRANTER
advancement
in heat transfer
technology



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**Cuts start-up time,
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New FLOW PATTERN for more even distribution

Multiple headers and multiple returns provide for FREE-FLO action — with practically instantaneous distribution of steam to all levels of the plate. Condensate "trapping" is held to a minimum. This gives the new MULTI-ZONE PLATECOIL a reserve capacity to deliver under overload conditions during "start-up." It also produces extremely fast recovery of tank temperature with minimum variation.

Operating pressures up to 250 psi

Higher pressure containment is achieved through the use of DURAWELD bonding of the plates and mill-controlled TRANSTEEL in standard MULTI-ZONE PLATECOIL units. This makes it possible to apply the time-proven advantages of PLATECOIL to many types of heating where 250 pound steam is required. Destruction tests have demonstrated a safety factor of more than 5 to 1.

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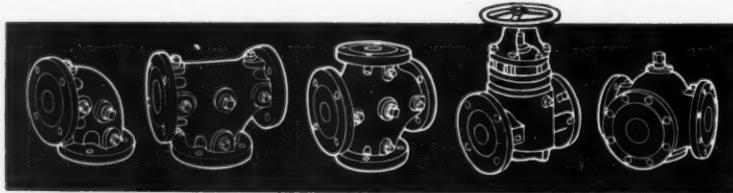
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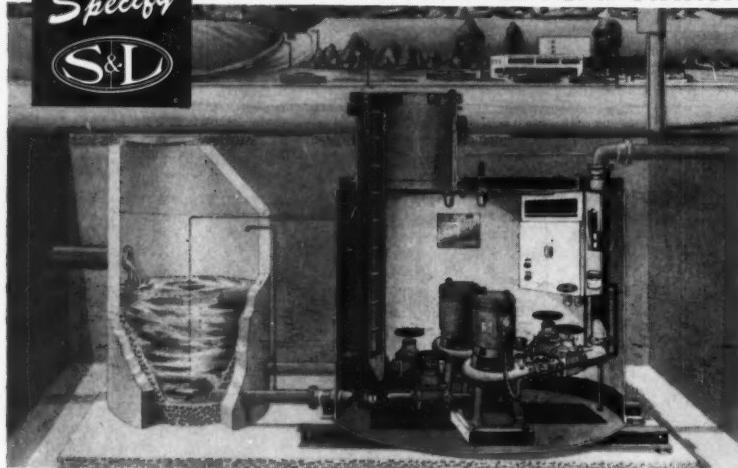
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and sanitary sewers, water lines. (civil) \$275,000. Client, American Builders.
¶ Sanitary sewer collection system. (civil) \$880,000. Client, Beaumont, Texas.
¶ Sanitary sewer collection system. (civil) \$1,089,000. Client, City of Beaumont, Voth-Rosedale area.

¶ Comprehensive water and sanitary sewer report. (civil) \$1 million. Client, City of Jasper.

¶ Additions to three warehouses for Port of Beaumont, Texas. (struc.) \$280,000. Client, Port of Beaumont.

¶ Three hundred-car parking garage, Beaumont, Texas. (struc.) \$300,000. Client, Boykin Garage.

¶ Study and report on sewage treatment plant. (civil) Client, Groves, Texas.

UTAH

Hodgson and Holbrook

Ogden, Utah

¶ Southeast elementary school consisting of 16 classrooms, Brigham City, Utah. Steel deck with concrete floors and brick wall construction. Includes multipurpose room and kitchen. (struc., civil, elec.) \$300,000 (est.). Client, Box Elder County School District.

¶ Washington School addition, Ogden, Utah. Two-story, reinforced concrete and brick. Includes new heating plant, elementary multipurpose room, girls' gym, kitchen, band and choral room, new domestic science department, and additional classrooms. (struc., civil) \$548,304. Client, Ogden Board of Education.

VIRGINIA

Sowers, Knowles & Rodes

Roanoke, Virginia

¶ Addition to Waynesboro Community Hospital, Waynesboro, Virginia. (mech., elec.) \$750,000. Client, Smithey & Boynton, architects.

¶ Northside high school, Roanoke County, Virginia. (mech., elec.) \$1 million. Client, Eubank, Caldwell & Assoc., arch.

¶ Public housing (125 units), Danville, Virginia. (mech., elec.) \$1,250,000. Client, W. W. Patterson, architect.

E. Barrett Foster

Sheffield, Alabama

¶ Underground electrical distribution system, Bristol, Virginia. (elec.) \$350,000. Client, Bristol, Virginia, Utilities Board.

William F. Appleton

Kingsport, Tennessee

¶ Health center, Galax, Virginia. Small county health office with space for health officer, sanitarian, nurse, clerks, two examination rooms, two consultation rooms, and lobby, plus full basement (unfinished) for future expansion. (civil, elec.) \$75,000. Client, Beeson & Beeson.

¶ Virginia Bag and Salvage Company, Bristol, Virginia. Check heating and air conditioning loads and existing equipment for correction of inadequacy. (mech.) Client, Bristol Gas Corporation.

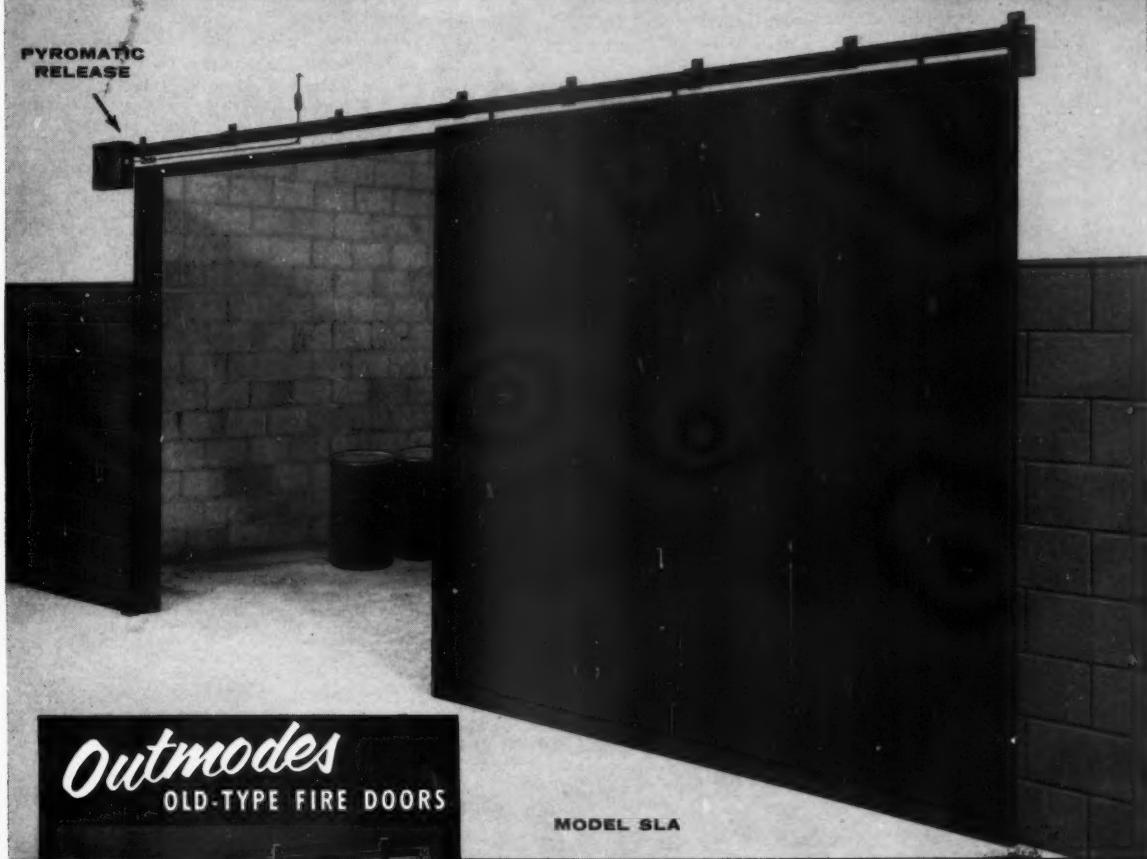
¶ Pound Elementary School, Pound, Virginia. 12-classroom building with office,

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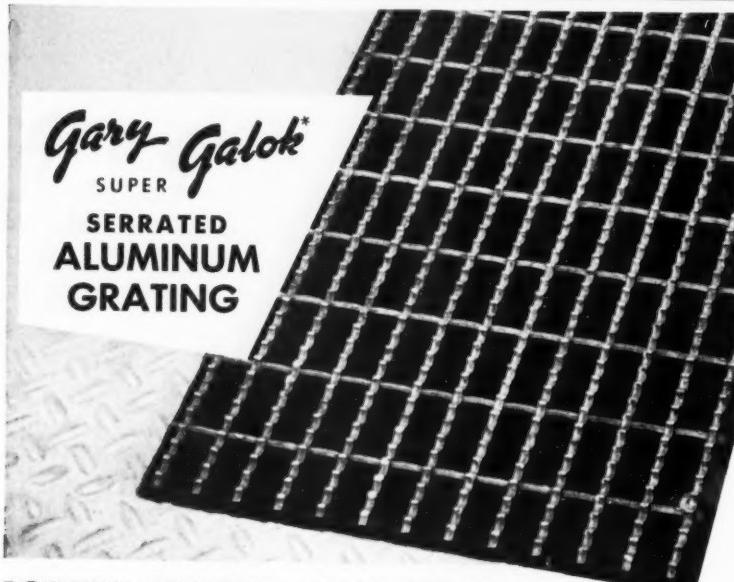
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KVA	Decibel Rating	KVA	Decibel Rating
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7.5	33	9.0	40
10.0	40	15.0	44
20.0	44	30.0	43
37.5	44	45.0	45
75.0	49	112.5	45
100.0	50	150.0	47

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dispensary, teachers' lounge on one floor located on site of present Pound (Wise County) High School. Project involves sewage treatment plant for entire school system (elementary and high school) plus recreational area lighting, and new heating plant for entire school. (civil, mech., elec.) Client, Beeson & Beeson.

WASHINGTON

Victor K. Schegolkov
Seattle, Washington

¶ Six buildings for Lower Columbia Junior College — boiler room, gymnasium, administration building, music building, study center, and classroom building. (struc.) \$1.3 million. Client, McGuire & Muri, architects.

¶ Swimming pool building, Lower Columbia Junior College. (struc.) \$260,000. Client, McGuire & Muri, architects.

Willard Johnson
Pasco, Washington
¶ Community building including bowling alley, Prosser, Washington. (elec.) \$75,000. Client, American Legion Capt. Green Post, C. Thompson, architect.

WEST VIRGINIA

Charles W. Stewart
Huntington, West Virginia
¶ Warehouse and office building. (struc., mech., elec.) \$200,000. Client, Coalton Enterprises, Inc.

WISCONSIN

R. J. Strass, Inc.
Milwaukee, Wisconsin
¶ St. Williams school, Milwaukee, Wisconsin. One floor with basement, folded plate roof. (struc.) \$200,000. Client, Herbst, Jacoby, Herbst, architects.
¶ Aluminum casting foundry addition, mill type, center monitor. (struc., civil, arch.) \$100,000 (est.) Client, Aluminum Castings.

Bartels & McMahan Engineering Company
Dubuque, Iowa
¶ Wharf. (civil) \$40,000. Client, City of Prairie du Chien, Wisconsin.
¶ Streets. (civil) \$40,000. Client, City of Prairie du Chien, Wisconsin.

WYOMING

R. L. Prussing Engineers
Billings, Montana
¶ Sheridan high school addition, Sheridan, Wyo. (mech.) \$60,000. Client, arch.

FOREIGN

C. G. Russell Armstrong
Windsor, Ontario
¶ Complete water filtration plant, including intake in the Detroit River and approximately two miles of distribution trunk main, varying in size from 16 to 24 inches to serve the towns of Riversdale, Tecumseh, Village of St. Clair Beach, and part of the townships of Maidstone

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and Sandwich East. (struc., civil, mech., elec.) \$328,300, struc.; \$170,000, civil; \$275,000, mech.; \$115,000, elec. Client, Riverside-Tecumseh Water Works Board.

Michel Zakrzewski & Partners
Durban, South Africa

¶ Ocean terminal including cargo sheds, precooling stores, and passenger terminal. (struc., civil) £2 million. Client, South African Railways and Harbours.

¶ Sea promenade and shark enclosure at Margate, South Africa. (struc., civil) £400,000. Client, Borough of Margate.

Engineering Consultants, Inc.
Denver, Colorado

¶ Feasibility investigations for two hydroelectric projects, Ceylon. (civil, elec.) \$380,000. Client, International Cooperation Administration.

Arthur G. Levy
Houston, Texas

¶ Continuous operations and reservoir studies, petroleum and natural gas, Helots-Brun Field, Israel. Client, MATSADA, United Petroleum Drilling Company, Ltd., Tel Aviv, Israel.

Cote, LeClair & Langlois
Sherbrooke, Quebec

¶ Seminary of Joliette, Joliette, Quebec. Classrooms, dormitories, recreation halls, gymnasium, Olympic swimming pool, and library. Heat obtained from existing power house. (mech., elec.) \$600,000 (mech., elec.), \$2.5 million (total). Client, Les Clercs de Saint-Viateur.

Ken R. White Consulting Engineers, Inc.
Denver, Colorado

¶ Technical and economic study of cement plant facilities near Colombo, Ceylon. Client, The Ceylon Cement Corp.

Harza Engineering Company
Chicago, Illinois

¶ Hydrological survey of Mekong River basin — Laos, Vietnam, Cambodia, and Thailand. Client, International Cooperation Administration.

Dr. Ing. P. Walter
Essen, Germany

¶ Design new cement factory and prepare reports. Market research, site selection, report on raw materials, efficiency. Prepare plans for execution. (struc., civil, mech., elec.) \$2.5 million. Client, Empresa Industrias, Guapan, Ecuador.

Charles Owen Brown
New York, New York
¶ Titanium dioxide pigment plant, Mexico. (process and chemical engineering) \$4 million. Client, Mexican government and Pigmentos de Mex.

Brett Ouellette Blauer Associates
Montreal, Quebec

¶ Place Ville Marie office building and plaza development, Montreal, Quebec. (struc.) \$100 million. Client, Webb & Knapp (Canada) Limited. ▲▲



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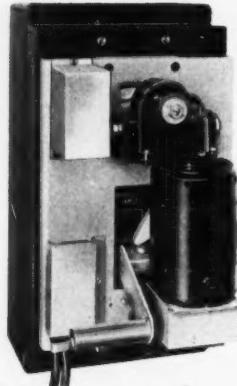
GOULDS  **PUMPS**

TOUGH APPLICATION OR DESIGN PROBLEMS?

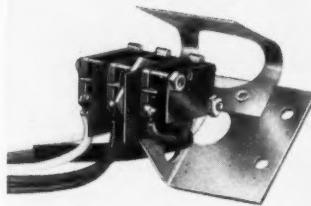
General Electric circuit breaker



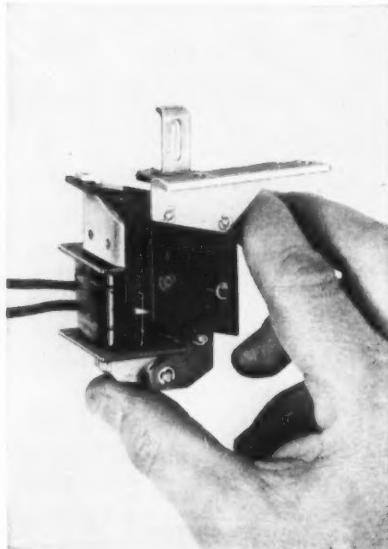
SHUNT TRIP: Opens breaker by remote control, permits pushbutton remote tripping. Used to disconnect power from a remote or centralized point or to interlock with other electrical circuits (AC or DC). Can be actuated by limit switch or relay for automatic feedback control.



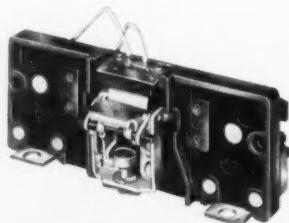
MOTOR-OPERATED MECHANISM: Opens, closes and resets breaker by remote control. Can be used for automatic reclosing or preferred-emergency hook-up by addition of relay. For automated installations, isolated unattended pumping stations, radar systems, etc.



AUXILIARY SWITCH: Operates relay and control circuits at same time as breaker. For remote indication of breaker position (ON or OFF) by means of indicating lights. Can also actuate relays, control related equipment, interlock with other breakers.



UNDERVOLTAGE RELEASE: Trips instantly when voltage dips. Used to protect motors, elevators, hospital and theatre lights against damage or loss of voltage and to actuate emergency equipment. Voltage must be restored before breaker can be reclosed. No time delay in operation.



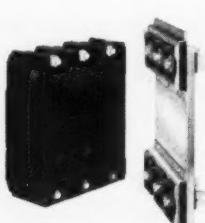
BELL ALARM SWITCH: Signals when breaker trips, protects against unobserved outage, resets automatically.



MECHANICAL INTERLOCK: Prevents two adjacent breakers from being closed in at same time.



CENTER STUDS: Permit use of one breaker and trip unit for double-wound generator or transformer, with full protection.



PLUG-IN SWITCHBOARD MOUNTING BASE ASSEMBLIES: Convert standard G-E breakers to plug-in. May be mounted side by side.

accessories are the answer!

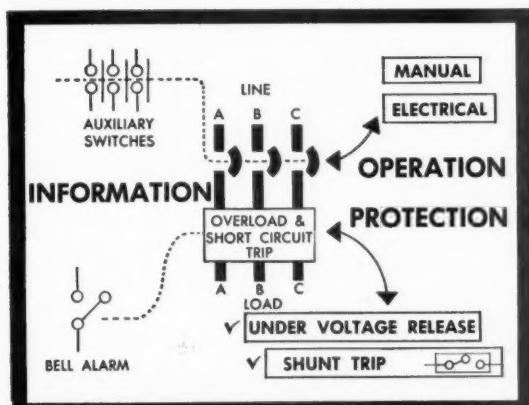
Versatile, convenient, most can be installed in the field

With ever-increasing automation and mechanization, complex control problems need fast solutions — and versatile General Electric circuit breaker accessories cover a wide range of applications to help you solve control problems. They can provide remote closing or opening, lowered voltage protection, overload trip-out indications, automatic reclosing, electrical or mechanical interlocking and primary or sequential operation. (See diagram below.)

For example, if you need to trip a circuit breaker by remote control, the G-E shunt trip is the device you need. It permits push-button remote tripping. In addition to remote control operation, the shunt trip can be used as an electrical interlock with other circuits, either AC or DC. Actuated by a limit switch for automatic feedback control, it is ideal for use in plant safety systems for machine limits, time limits, or any kind of a positive action system.

And you no longer have to wait weeks for delivery of factory-installed accessories. Most General Electric accessories can be field-installed on standard breakers, by your own men, when you need them. Efficient, reliable G-E circuit breakers and accessories answer the growing need for circuit protection, operation and information.

For complete information, see your nearest General Electric distributor, or write Department CBA, General Electric Company, Circuit Protective Devices Department, Plainville, Conn.



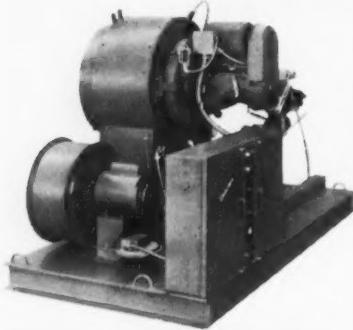
PROTECTION, INFORMATION, OPERATION — this example shows how several accessories might work together to give you all 3: Undervoltage device provides low-voltage protection. Auxiliary switch shows you breaker is open. Bell alarm switch tells it has opened on a short or overload. Motor operated mechanism gives you emergency power throw-over or remote operation.

General Electric makes
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Consulting Engineers' Calendar

Conference, Lord Baltimore Hotel, Baltimore, Maryland.

Oct. 11-16. American Institute of Electrical Engineers; Fall General Meeting, Morrison Hotel, Chicago, Illinois.

Oct. 19-23. American Society of Civil Engineers; Annual Convention, Hotel Statler, Washington, D. C.

Oct. 20. American Institute of Consulting Engineers; Annual Dinner, Mayflower Hotel, Washington, D. C.

Oct. 20-22. American Standards Association; 10th National Conference on Standards, Sheraton-Cadillac Hotel, Detroit, Michigan.

Oct. 26-28. American Road Builders' Association; National Highway Conference, Leamington Hotel, Minneapolis, Minnesota.

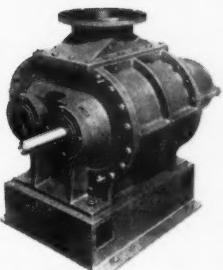
Oct. 27. Association of Consulting Chemists and Chemical Engineers, Inc.; Annual symposium and banquet, Hotel Shelburne, New York, N. Y.

Nov. 3-5. American Concrete Institute; Regional Meeting, Continental Hilton Hotel and Hotel Del Prado, Mexico City, Mexico.

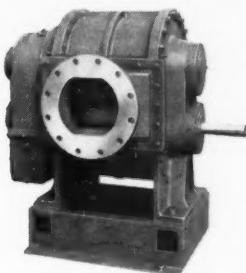
Nov. 4. American Institute of Consulting Engineers; Luncheon Meeting, Engineers Club, New York, N. Y.

Nov. 16-19. American Institute of Electrical Engineers; Fifth Conference on Magnetism and Magnetic Materials; Sheraton-Cadillac Hotel, Detroit, Michigan.

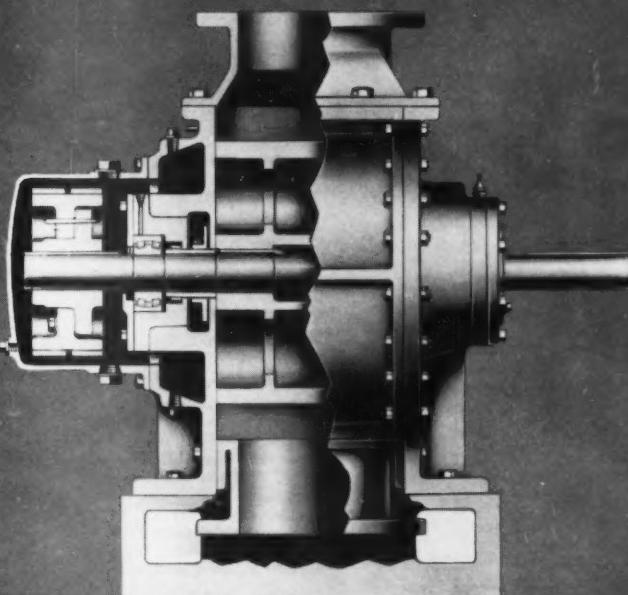
Nov. 30-Dec. 4. 27th Exposition of Chemical Industries, New York Coliseum, New York, N. Y.



Series 400 Blowers are manufactured of close-grain cast iron, reinforced to prevent distortion under severe conditions.



Series 400V, same as above, mounted vertically. Extended bases provided at additional cost, for mounting motor and drive.



NEW "400" SERIES SUTORBILT ROTARY POSITIVE BLOWERS

**with oil-free operation and
easy-to-adjust timing hub for peak efficiencies**

Designed for heavy-duty, continuous delivery of precisely metered air or gas, the new "400" Series Sutorbilt blowers are available in 30 sizes—from 1½ to 40 cubic foot displacement. Because Sutorbilt blowers require no lubrication, compressed air or gas is oil-free—an important feature to food, chemical and other industries.

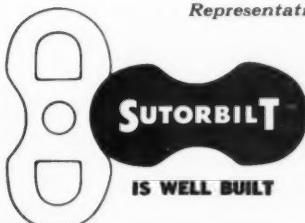
Easy-to-adjust timing hub lets you re-time the new "400" series right on location. Without removing the unit from the line, you simply slacken hub bolts and remove locking pins from impeller gears to adjust internal clearance. This is accomplished in a few minutes

with the Sutorbilt timing hub. No disassembling for adjustment!

Other features of Sutorbilt "400" Series blowers include wideface herringbone timing gears that minimize wear and maintain close impeller tolerances. Impeller shafts turn on four oversize, heavy-duty roller bearings that keep shafts in perfect alignment and lower mechanical friction.

For long, maintenance-free service plus peak, positive pressure through the years, specify Sutorbilt blowers. Write for illustrated brochure S-65C giving complete specifications.

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ADVERTISERS' INDEX

AA Wire Products Co.	68
Adams Co., Inc., R. P.	174
Aerovent Fan Co., Inc.	16
Air Devices, Inc.	14-15
Air Preheater Corp.	49
Allis-Chalmers	3, 65
American Gas Association	191
American Marsh Pumps	22
American-Standard, Industrial Division	41
American Vitrified Products Co.	230
Ammerton Co., Inc.	46
AMP, Inc.	140
Anaconda Wire & Cable Co.	166-167
Appleton Electric Co.	39
Armclo Drainage & Metal Products, Inc.	61
Auth Electric Co.	79
Babcock & Wilcox Co.	197
Baltimore & Ohio Railroad	54
Barber-Colman Co.	170-171
Barco Manufacturing Co.	40
Bayley Co., The William	75
Beatty Scaffold, Inc.	63
Bettcher Mfg. Corp. Panelbloc Div.	164
Bituminous Coal Institute	134-135
Borden Metal Products Co.	29
Buffalo Forge Co.	23
Burgess-Manning Co.	157
Burnham Corp.	207
Burt Manufacturing Co.	60
Byers Co., A. M.	24-25
Canton Stoker Corp.	204
Ceilcote Co., Inc.	72
Certified Ballast Mfgs.	153

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Chrysler Corp., Airtemp Div.	53
Cleaver-Brooks Co.	74
Climax Engine Mfg. Co.	143
Combustion Engineering Inc.	3rd Cover
Committee on Steel Pipe Research	209
Concrete Reinforcing Steel Institute	160
Concrete Thermal Casings, Inc.	52
Condenser Service & Engrg. Co., Inc.	37
Connor Engineering Corp.	131
Couch Co., S. H.	48
Cyclotherm Div., National-U.S.	
Radiator Corp.	161
Day-Brite Lighting, Inc.	78
DeZurik Corporation	151
Dow Corning Corp.	163
Dunham-Bush, Inc.	67
Dur-O-wal Products, Inc.	58
Dusing & Hunt, Inc.	219
Edwards Co., Inc.	147
Electric Products Co.	162
Emhart Mfg. Co., Maxim Div.	173
Flexitallic Gasket Co.	51
Fly Ash Arrestor Corp.	64
Fyr-Fyter Co.	136-137
General Electric Co.	35, 36, 200-201, 224-225
Globe Co., Products Division	176
Golden Anderson Valve Specialty Co.	66
Goodrich Chemical Co., a Div. of The B. F. Goodrich Co.	133
Goodyear Rubber Co.	196
Goulds Pumps, Inc.	223
Granco Steel Products Co.	6-7
Graver Tank & Mfg. Co., Inc.	155, 156
Graver Water Conditioning Co.	4
Hamilton Kent Mfg. Co.	128
Hardinge Co., Inc.	192
Haughton Elevator Co.	55
Haws Drinking Faucet Co.	84
Heinemann Electric Co.	206
Hendrick Mfg. Co.	59
Hetherington & Berner, Inc.	218
Hevi-Duty Electric Co.	220
Hotel Mt. Lake	222
Ideal Electric & Manufacturing Co.	132
Illinois Water Treatment Co.	38
Inland Steel Products Co.	62
Intrusion-Prepatk, Inc.	203
Iron Fireman Mfg. Co.	193
Irving Subway Grating Co., Inc.	50
I-T-E Circuit Breaker Co.	56-57
Jeffrey Mfg. Co., The	19
Johns-Manville Corp.	175
Johnson Co., S. T.	162
Johnson-March Corp.	208
Johnson Service Co.	185
Keasbey & Mattison Co.	44-45
Kerite Co., The	129

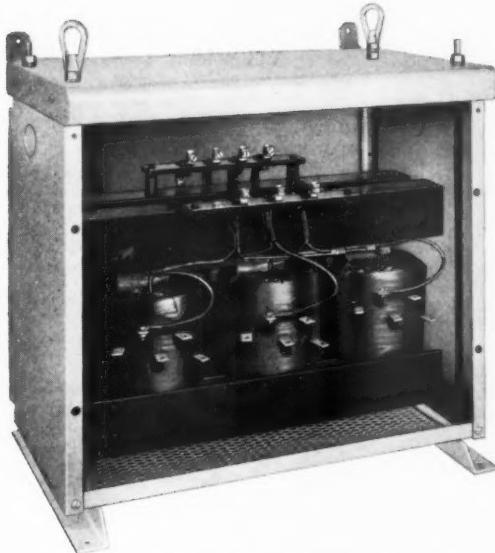
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Kerrigan Iron Works Co.	71
Kineer Mfg. Co.	146
Kraloy Plastic Pipe Co., Inc.	221
Lamson & Sessions Co.	138-139, 165
LENNOX Industries Inc.	172
McDonnell & Miller, Inc.	210
Magnetrol, Inc.	130
Mahon Co., The R. C.	168-169
Master Builders Co.	30-31
Master Fan Corp.	222
Medford Hotel	164
Michael Flynn Mfg. Co.	10-11
Minneapolis-Honeywell Reg. Co.	69-70
Moloney Electric Co.	145
National U.S. Radiator Corp.	141
Nesbitt Inc., John J.	81
Niagara Blower Co.	202
Northern Blower Co.	150
Nugent & Co., Inc., Wm. W.	42
Oasis Water Coolers	
The Ebco Mfg. Co.	21
Ohio Injector Co.	2nd Cover
O-Z Electrical Mfg. Co., Inc.	189
OZALID, Div. of General Aniline & Film Corp.	159
Pass & Seymour, Inc.	154
Peerless Electric Co.	211
Penn Ventilator Co.	179
Perlite Dept.	
Great Lakes Carbon Corp.	144
Petrometer Corp.	128
Pratt Co., The Henry	142
Reliance Gauge Column Co.	188
Republic Steel Corp.	180-181
Rice Hotel	160
Roberts & Schaefer Co.	177
Rockwell Standard Corp.	
Grating Division	220
Ronald Press Co.	184
Roper Hydraulics, Inc.	152
Royal McBee Corp.	148
Schaub Engineering Co., Fred H.	214
Sims Co., Inc., The	158
Smith & Loveless, Inc.	218
Smoot-Holman Co.	195
Soiltest, Inc.	196
Sorgel Electric Co.	229
Sparkler Manufacturing Co.	190
Square D Co.	47
Standard Electric Time Co.	205
Stebbins Engineering & Mfg. Co.	82
Stromberg-Carlson Co.	216
Superior Combustion Industries, Inc.	149
Sutorbilt Corp., Subs. of Fuller Co.	227
Sylvania Lighting Products	
Div. of Sylvania Electric Co., Inc.	26-27
Tectum Corporation	43
Temprite Products Corp.	186
Texsteam Corp.	178
Thermal Engineering Corp.	18
Thompson Electric Co.	212
Tranter Manufacturing Co.	217
Tubular Products Co.	20
U.S. Steel Corp.	
American Bridge Div.	17
American Steel & Wire	198-199
High Strength Steel Div.	76-77
Missiles & Rockets	32-33
Vogt Machine Co., Henry	13
Wagner Electric Corp.	215
Webster Engineering Co.	226
Weighing & Control Components, Inc.	80
Weinman Pump Mfg. Co.	194
Westinghouse Electric Corp.	
Agency & Construction	123-124-125-126
Switchgear Div.	8-9
Transformer Div.	182-183
White Diesel Engine Div.	
The White Motor Co.	83
Whiting Corp.	73
Williams Equipment & Supply Co.	196
Wood Co., R. D.	187
Worthington Corp.	4th Cover
Yarnall-Waring Co.	85
Youngstown Sheet & Tube Co.	213

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45 Kva 3-phase transformer with taps.
Interchangeable wall or floor mounting.
Front panel removed, showing interior.

COMPLETE LINE FOR EVERY PURPOSE up to 10,000 Kva, up to 15,000 volts, including special transformers and saturable reactors.

The same quiet SORGEL transformers are also incorporated in substations. Procurable with any type or make of switchgear, or from any electrical manufacturer.

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longer, stronger **AMVIT** Jointed Clay Pipe prevents infiltration **SIX WAYS**

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They limit the amount of infiltration in sewer pipe joints, which, in turn, reduces pumping and treatment plant costs. Amvit* Jointed Clay Pipe was especially designed to achieve best possible results.

1. FACTORY-MADE QUALITY

The Amvit Joint is manufactured from plasticized resins of polyvinyl-chloride. No other combination of materials is used or needed. It is applied on the pipe by a special manufacturing process and delivered to the job site ready for immediate installation.

2. DESIGN PREVENTS LEAKS

The Amvit Joint is a compression type joint based on the ball and socket principle. The material on the spigot end is a convex shape, with the bell end in a concave shape. Simply pushing the pipe together "makes" the joint, keeping the surfaces of the bell and spigot rings in constant compression.

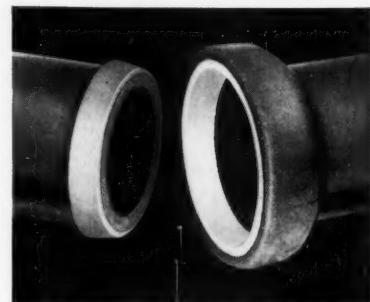
Thus, infiltration, exfiltration, and root penetration are prevented.

3. QUICK, FOUL-PROOF INSTALLATION

The joint is on the pipe delivered to the job site ready for immediate installations. No other materials such as caulking, joint compound, hot pots, or lades are needed to make the Amvit Joint.

4. PERMITS DEFLECTION, ABSORBS SHOCKS

Amvit is made from a plastic which has many characteristics similar to rubber. It is pliable, permitting deflec-



tion without leakage. It is resilient, can absorb shocks, and vibration.

5. BETTER FLOW, LESS MAINTENANCE

The design of the joint assures that the pipe is self-centered at all times. This gives perfect alignment and self-cleansing action. Because the joint is really tight, no foreign matter such as dirt, sand, or stones can possibly enter the line.

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Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house to treatment plant.



Amvit Jointed Clay Pipe, in sizes 4" through 24", together with all fittings is available for immediate delivery in the Northeast and Central States.

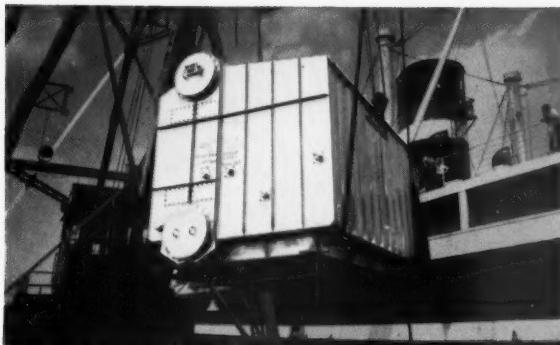
For more information on how Amvit can help cut your sewer installation costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you, for this descriptive folder.



SINCE 1848



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▲ A C-E Package Boiler, Type VP, en route to Europe. This boiler type is available with capacities from 4,000 to 90,000 lb of steam per hr, with pressures to 700 psi and temperatures to 750 F in certain sizes. It is designed for oil or gas firing. Several hundred of these units are now in service.



▲ A shop-assembled Controlled Circulation Boiler, Type PCC, being prepared for shipment. This type unit is available with steam capacities from 80,000 to 120,000 lb per hr, and with pressures and temperatures to 1000 psi and 900 F. For special applications, designs are available to provide higher steam pressures and temperatures. Seven PCC Boilers are now in service.



▲ A shop-assembled C-E High-Temperature Water Boiler, Type HCC, being unloaded at a midwest manufacturing plant. It is one of two 12-million-Btu boilers used for plant heating. Available for capacities from 10 million to 300 million Btu, this unit type is shop-assembled in sizes up to 50 million Btu for oil or gas firing — up to 40 million Btu for coal firing. Currently, more than 50 HCC Boilers are in service or on order.

NOW

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Three service-proved designs with capacities to 120,000 lb per hr... pressures to 1000 psi... temperatures to 900 F

The economies inherent in shop-assembled boilers can now be yours even if your steam requirements are as high as 120,000 lb per hr. The C-E line, consisting of three basic unit types, has been expanded to include pressures, temperatures and capacities well beyond normal package-type limits.

The standard, natural-circulation, **C-E Package Boiler—Type VP**—is now available with capacities to 90,000 lb per hr, and with pressures and temperatures to 700 psi and 750 F.

Where greater steaming capacity is required, or where higher pressures or temperatures are needed for industrial processing or power generation, the shop-assembled **C-E Controlled Circulation Boiler—Type PCC**—is available. It is designed for the 80,000-to-120,000-lb capacity range, with pressures to 1000 psi and temperatures to 900 F. For special applications, this unit is also available for considerably higher pressures and temperatures.

The **C-E High-Temperature Water Boiler—Type HCC**—is an ideal type for large space-heating and certain

process uses. It is also available in shop-assembled form for capacities to 50 million Btu per hr. It is designed for pressures to about 500 psi, and can provide water at 450 F or higher.

The new, high-capacity ranges of these shop-assembled units represent the logical evolution of familiar and successful designs that have been proved in service for quality, economy and performance.

Catalogs on any or all of these units available on request.

COMBUSTION ENGINEERING



C-202A

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.
Canada: Combustion Engineering-Superheater Ltd.

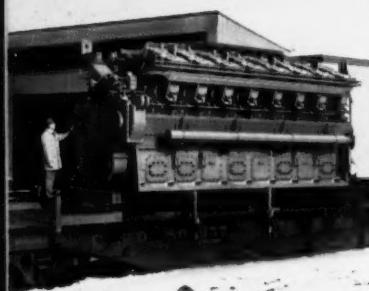
ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

ARE YOU AN ENGINE EXPERT?

An interview with William M. Kauffmann, Chief Engineer of the Engine Division, Worthington Corporation An engine is only as good as the design philosophy behind it. In this short interview, Mr. Kauffmann answers some of the questions most frequently asked him. If you would like to have more complete information about the Worthington line of engines and engine compressors, won't you write to Worthington Corporation, Section 43-6, Harrison, N. J. In Canada: Worthington (Canada) Ltd., Brantford, Ontario.



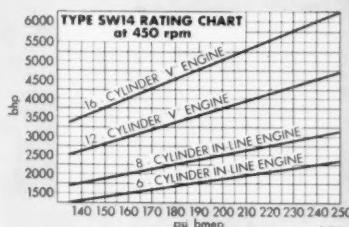
Q.



A. Our belief is engines can operate safely today at speeds in the neighborhood of 500 rpm. Shafts can be designed free of critical vibrations through all speed ranges. Of course, other advantages obtained from higher speeds are smaller and less costly generators, less required floor space.

Q.

DOES THE SW14 HAVE SPEED LIMITS IN RPM?



V.13, No. 3

Part 2 August 1959

Consulting Engineer

Keep This Directory in Your
Technical Reference File

A DIRECTORY OF ADVERTISERS' LITERATURE

Air Cleaning & Dust Collection	2	Mechanical Power Transmission	28
Air Cond., Heating, & Ventilating	3	Office Equipment & Services	29
Electrical Equipment	11	Piping, Valves, & Plumbing	30
Fire Protection	18	Power Equipment & Fuels	36
Heat Exchangers & Water Heaters	18	Process Equipment	40
Highways, Bridges, & Streets	19	Pumps & Compressors	42
Instruments & Controls	20	Refrigeration & Liquid Chillers	44
Insulation	23	Sound, Signal & Alarm Systems	45
Lighting	24	Structural Materials & Equipment	47
Materials Handling & Storage	26	Water Treatment & Waste Disposal	53



AIR CLEANING and DUST COLLECTION



1—Electronic Air Filters

AAF high velocity electro-cell electronic air filter Bulletin 258A explains principle of operation, details basic design features, describes how filter is shallower, has smaller face area, requires less space than other high velocity precipitators, has low power consumption, automatic maintenance.

American Air Filter Co., Inc.



2—Dust Control Systems

Catalog SJP-1001 describes new *Chem-Jet* dust control systems for suppression of coal dust at rotary car dumpers, car shakeouts, track hoppers, conveyor transfer points, coal crushers, reclaim hoppers, and coal storage piles. Includes description of new Type A Hydro-Precipitator scrubber.

Johnson-March Corp.



3—Charcoal Air Purifiers

Bulletin T-264 describes types of equipment available for air purification by the "Black Magic" of activated charcoal. Details and specifications concerning portable purifiers, disposable filters, wall units, heavy duty cells, and cabinet purifiers. Charcoal increases comfort and safety in living and working spaces.

Barnebey-Cheney Co.



4—Miniature Cyclone Dust Collectors

Cylindrical and rectangular collectors for recovery of particles down to 12 microns at 100% efficiency without use of filter media or tendency to plug. Collection applications include rotary, flash or spray dryers; high temperature recovery, and recovery of extremely fine abrasives. Dustex catalog 12159.

Dustex Corp.



5—Dust Collectors

Dustkop model 30N5OP, a one-unit system serving 7 grinders. Where floor space is limited, unit is suspended from ceiling or installed on roof. Pipe is angled from collector to caster-mounted dust drum placed in any unused area. Drum is rolled to outside dumping point and emptied without recirculating dust.

Aget Manufacturing Co.



6—Carbon Air Purifiers

Bulletin 108A describes and illustrates *Dorex* activated carbon air purification equipment, C cells and H canisters. Data on equipment selection, installation, application is provided. Also given is information on unique *Dorex* replacement service. Discussions of activated carbon and conditions for proper purification.

Connor Engineering Corp.



7—Flue Gas Sampler

Data Sheet 5-ATC-1, published by Aerotec Industries, Inc., describes the Aerotec flue gas sampler. Motor and fan are detachable for ease of handling. Units may be supplied with or without fans, and are equipped with the high efficiency Aerotec tube. Sheet 5-ASC-2 describes operation of Aerotec sampler.

Aerotec Industries, Inc.



8—Dust Collectors

Small and medium size dust collectors, applicable to single machines or small groups of equipment producing undesirable dust, are described in four-page bulletin 162-6. Capacities range from 300 to 1350 cfm; 5000 fpm velocity in pipes, and 8 in. static pressure at the fan. Portable and semi-portable sizes.

Northern Blower Co.



9—Cyclone Dust Separators

Bulletin sheets describe several models of cyclone dust separators, contain photographs of actual installations, multiple rating tables, specifications, floor space requirements, and dimensional drawings. Sheets are printed in two colors. Explain the use of after-filter where air is to be recirculated.

Torit Manufacturing Co.



10—Vacuum Cleaning Systems

The Spencer Turbine Company's catalog 160 describes and illustrates installed vacuum cleaning systems for schools, offices, hospitals, hotels, restaurants, clubs, civic and municipal buildings. Included is a description of the various uses of the system and what satisfied users think of it. Spencer representatives listed.

Spencer Turbine Co.



11—Industrial Dust Control

Bulletin 800 contains full technical information on industrial dust control and recovery equipment. Five types of dust filters are described in detail — four bag-type collectors, one cyclone type. Complete specifications for each model within each series are included. Photographs illustrate existing dust control systems.

Dracco Division of Fuller Co.



12—Dust Collectors

New 8-page bulletin SC-15 contains complete information on the entire line of Whirlex dust collectors. Included is information on the replaceable cyclone elements and a completely new high volume, minimum space wet collector (Patent pending). Illustrations of operation and construction.

Fly Ash Arrestor Corp.

To order personal copies of these bulletins fill

DIRECTORY OF ADVERTISERS' LITERATURE

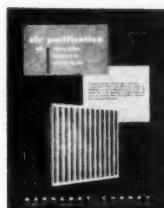
AIR CLEANING and DUST COLLECTION continued



13—Fly Ash Dust Control

Bulletin V-100 introduces the *Verticone* conditioner for fly ash dust control or for unloading of dusty materials from bins and silos. The *Verticone* also provides first practical means of dust-free unloading of cyclones, bag filters, and electrostatic precipitators. Units available up to 200 tons per hour capacity.

Johnson-March Corp.



14—Charcoal Purifiers

Comprehensive bulletin describes activated charcoal purification cells and how they can save heating and cooling costs by permitting recirculation of air. Installation and construction details, air capacities, and resistances to air flow. Outlines charcoal reactivation services and testing procedures.

Barnebey-Cheney Co.



15—Electronic Precipitators

AAF's Model B *Rollotron*, combination electronic precipitator and automatic-renewing disposable media air filter, is described in Bulletin 249A. It explains details of operation, electronic principle, explanation of agglomerator and storage sections, has equipment drawings, capacity and dimension tables.

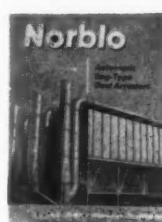
American Air Filter Co., Inc.



16—Dust Collectors

Bulletin describes cabinet cloth filter dust collectors and their advantages. Contains illustrations of actual installations together with multiple rating tables, complete specifications, and floor space requirements. Also included are dimensional drawings of the product. Bulletin is printed in 2 colors.

Torit Manufacturing Co.



17—Bag-Type Dust Collectors

How the *Norblo* automatic bag-type dust collector can provide continuous operation at full capacity is explained in four-page folder 164-5. Dimensions and capacities are listed in tabular form. A flow diagram explains how the unit works. Each part of the collector is shown separately with its description.

Northern Blower Co.



18—Dust and Mist Collectors

Bulletin 736 illustrates the entire *Aget* line and includes complete dimensions and specifications. Forty basic *Dustkop* units will collect everything from wood chips to fine dust particles. Also 4 *Mistkops*, 4 *Filterkops*, 2 *Dustbusters*. Descriptive copy and recommended uses for models. Photographs of installations.

Aget Manufacturing Co.

AIR CONDITIONING, HEATING and VENTILATING



19—Package Water Chillers

Bulletin HB-459 details a new line of refrigeration and air conditioning equipment ranging in capacity from 7½ hp to 150 hp. Features of units described and illustrated. Package water chillers are completely described. Diagrams for different types of heating-cooling show heating in red, cooling in blue.

Bell & Gossett Co.



21—Door Grilles

Catalog F 8308-2 contains complete information on *Uni-Flo* visionproof *Site-Tite* and *Lite-Tite* door grilles. This bulletin illustrates door grille dimensions, lists grille sizing chart, and gives accurate up-to-date specifications for *Uni-Flo* door grilles. Typical applications and installations pictured.

Barber-Colman Co.



20—Duct Heaters

Four page bulletin describes Lennox GSD1 duct heaters with two stage control. Adaptable for space and process heating, ventilation, air conditioning, and make-up air. Output from 120,000 through 420,000 Btu/h. For larger heating outputs these extremely compact units can be grouped in a small space.

Lennox Industries Inc.



22—Two-Pass Boilers

Bulletin B-3232 describes the Titusville Trojone 2-pass units for high pressure process and power steam, or for low pressure heating. Available in 22 sizes for low pressure from 26 to 714 hp and in 13 sizes for high pressure from 20 to 600 hp. Bulletin lists design and construction features. Also illustrates units.

Titusville Iron Works Co.

AIR CONDITIONING, HEATING and VENTILATING continued**23—Air-Cooled Condensers**

Bulletin F-4095 gives complete data on a new line of low silhouette units which eliminate problems common to other air-cooled condenser designs. Shipped as factory assembled packages. Vertical discharge gives accurate control regardless of wind. Unique by-pass damper head pressure control.

Buffalo Forge Co.

**29—Gravity Ventilators**

Colt catalog, 20 pages, describes new line of "SR" and "O/SR" gravity ventilators. Special airfoil shape increases velocity of extraction. Weatherproof, adjustable center gives reserve extraction ability for exceptionally hot days, is unique in gravity ventilators. Catalog fully illustrates and details new line.

Colt Ventilation of America, Inc.

24—Hot Water Boilers

Bulletin HCC-2, a 20-page brochure, describes and illustrates the design, construction, advantages, and economies of the C-E LaMont controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison table of heat content.

Combustion Engineering, Inc.

**30—Tank Ventilating Systems**

Bulletin DT-7-52 deals with design of lateral tank ventilation systems, using bifurcator fans. Includes fume removal information in problem-solution form, detailed tank diagrams, fan wheel material selection charts, and 10 graphs for calculating required CFW.

DeBothezat Fans, Division of American Machine & Metals, Inc.

25—Air Make-Up Units

Bulletin 880 describes and illustrates Aerovent's new gas-fired, steam and hot water air make-up unit for roof or wall type mounting for various capacities and pressure conditions. Also included is design, control, and application data with additional information on filtered air supply and air heater units.

Aerovent Fan Co., Inc.

**31—Air Mixing Units**

Catalog DD-4 describes dual-duct air mixing units and accessories for automatic control of high-velocity air conditioning systems; permits wide conditioning variations even for adjacent spaces. Automatic control feature maintains constant volume despite variations in static pressure. Units are pictured, diagrammed, and described.

Buensod-Stacey, Inc.

26—Coil-Type Spray Dehumidifiers

Bulletin 37 gives complete information on Marlo coil type spray dehumidifiers for washing, cleaning, humidifying, dehumidifying, heating and cooling, available in 327 sizes, air volumes from 600 to 76,000 cfm. Bulletin includes design specifications, dimensional data, and engineering data.

Marlo Coil Co.

**32—Central Air Conditioning Units**

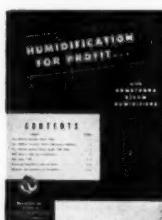
Catalog 383A describes Model ACM multi-zone central station type air conditioning units from Acme Industries. They serve up to 16 separate zones and are available in 5 sizes with 56 coil combinations. One unit heats, cools, filters, humidifies, dehumidifies in any combination, singly or simultaneously.

Acme Industries, Inc.

27—Cooling Towers

Catalog 32C9a gives complete selection data on Recold's outstanding line of Dri-Fan cooling towers. These units incorporate Recold's patented "Corner Construction" for accessibility, water seal "Access Doors," and exclusive "Bleed Funnel" to reduce mineral deposits. Complete information given.

Recold Corp.

**33—Humidification**

"Humidification for Profit", 16-page bulletin 5001, gives data showing how relative humidity affects hygroscopic materials, health and comfort, and formation of static electricity. Schematic diagrams and sectional drawings demonstrate operation of electric and air-operated steam humidifiers.

Armstrong Machine Works.

28—Roof Ventilators

Bulletin LX-59C describes the complete line of Penn Linex roof ventilators. Features are listed. Capacity and dimensional charts are furnished for easy selection of low silhouette-type units. Detailed drawings and tables for standard weights and gauges are also covered. Suggested specifications are included.

Penn Ventilator Co., Inc.

**34—Hot Water System Boilers**

"Package Boiler Economy for Modern Hot Water Systems," describes Cyclotherm's Cyclonic Combustion, a patented principle, now incorporated in a design to efficiently produce hot water. No other type boiler can match the package unit for economy of space and fuel.

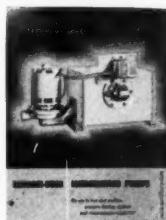
Cyclotherm Division

National-U.S. Radiator Corp.

To order personal copies of these bulletins fill

DIRECTORY OF ADVERTISERS' LITERATURE

AIR CONDITIONING, HEATING and VENTILATING continued



35—Condensation Pumps

Bulletin 1403A lists details of new Dunham-Bush condensate pump models for use in low and medium pressure heating systems and steam-process equipment. Ten year receiver tank warranty. Brochure contains data on features, dimensions, weights, capacities, and typical specification sheets.

Dunham-Bush, Inc.



41—Central Air Conditioners

Bulletin CSHV 312.01 describes and pictures Drayer-Hanson central air conditioners. It covers two units, the two fan vertical and two fan horizontal. Cutaway photograph shows operation. Specifications include frame construction, panels and trim, finish, insulation.

Drayer-Hanson, Div. of National-U.S. Radiator Corp.



36—Cast Iron Boiler-Burner Units

Bulletin C-272 describes the first cast iron boiler-burner units for No. 5 oil, and combination gas-light oil for commercial and industrial heating systems. Capacity range from 814 mbh to 2,942 mbh (32.4 to 113.2 hp). Includes construction and control features, ratings, dimensions, and structural diagrams.

Weil-McLain Co.



42—Air Conditioners

Catalog 36T-73 describes this new series designed to provide selective air conditioning for each room or unit in commercial, industrial, and residential buildings in conjunction with boiler-chiller sources. Includes capacity selection, heating and cooling tables, curves, general specifications. Illustrated.

Carrier Corp.



37—Gas Burners

Bulletin B-8 describes the Webster Kinetic gas burner with complete information on how to select burner size, the automatic operating controls, combustion safeguards, and control valve selection. Charts and diagrams illustrate information. Use of Kinetic for conversion of heating boilers is discussed.

Webster Engineering Co.



43—Scotch Type Steel Boiler

Catalog of Burnham Scotch type steel boiler data furnishes design and engineering information regularly required by consulting engineers and the heating industry. Gives S.B.I. ratings, lbs steam per hour—all pertinent dimensional data for complete specifications. Catalog is completely illustrated.

Burnham Corp.



38—Cooling Towers

"LoLine" cooling towers for air conditioning, industrial service are detailed in this new 16-page bulletin, 5.1.902, Rev. 4. Available in two heights, units have low silhouette, high performance, attractive appearance. Literature contains engineering data, dimensional drawings, specifications, tables for both series.

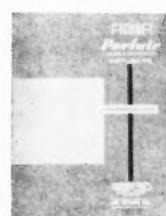
J. F. Pritchard & Co. of California.



44—Radial Flat Blade Fans

New bulletin 586 describes packaged industrial fans with radial flat blade wheels. Available in sizes 141 through 361. Economically designed, they feature one-man motor installation and removal. Motor and belt pull are on vertical centerline. They are easily rotatable or reversible in the field.

New York Blower Co.



39—Perforated Air Diffusers

Catalog P-200 describes the new series of adjustable and non-adjustable *Perfair* perforated air diffusers which incorporate interchangeable cores available in unlimited air pattern arrangements for 1-2-3-4 way blows. The catalog contains complete engineering, application, and installation data.

Air Devices Inc.



45—Radiant Panel Heating

"Radiant Panel Heating with Steel Pipe," 48 pages, covers the history of this type of heating, basic design, floor, ceiling, and wall panels, information on snow melting systems, pipe coil integration, design of a floor coil system, and a boiler hook-up diagram.

*Committee on Steel Pipe Research,
American Iron and Steel Institute.*



40—Propeller Fans

Bulletin 695 describes Robbins & Myers direct drive propeller fans. Specifically designed for use where quiet operation is needed. Modern airfoil design assures maximum efficiency and provides large volume air movement at low speeds. Diagrams show fan as well as shutter dimensions. Specifications included.

Robbins & Myers, Inc.



46—Space Heaters

Bulletin A1/2.1a describes the newly redesigned line of heavy duty space heaters for gas, oil, or dual fuel firing. The line includes 10 sizes of heaters, 400,000 to 2,000,000 Btu; all can be installed for up-flow, down-flow, or horizontal discharge and can be used with or without ducts. Bulletin gives all data.

Reznor Manufacturing Co.

AIR CONDITIONING, HEATING and VENTILATING continued**47—Self-Contained Boilers**

Bulletin AD-163 describes the Cleaver-Brooks 15 to 600 hp modern self-contained boilers. This fully automatic packaged boiler is for commercial, industrial, and institutional use. For steam, 15 lb to 250 lb or hot water. Operates with heavy oil, light oil, or gas. Design and construction in word and picture.

Cleaver-Brooks Co.

**48—Roof Exhausters**

Bulletin 58-HA describes the new addition of the all-aluminum belt-driven Hi-D[®] axial power roof exhauster. Available in 24 models in capacity ranges from 3330 cfm to 28,650 cfm and equipped with totally enclosed ball-bearing motors and full ball-bearing tubular drive assembly.

Jenn-Air Products Co., Inc.

**49—High-Velocity Air Conditioning**

Four-page bulletin 1312 covers the Hi-Static Multitherm unit, developed principally for high-velocity, conduit type air conditioning systems. Available in seven sizes, covering a volume range of about 2500 through 22,000 cfm, and suitable for systems with a static pressure of 8-in. wg maximum. Specifications.

Clarage Fan Co.

**50—Boiler for Low Setting**

Catalog LSD-10-1 describes a new compact firebox boiler ideal for projects where standard boilers are not easily installed. This "low-setting" boiler permits direct firing into combustion chamber through firedoor opening eliminating setting and hearth costs. Rating and dimensional data given in chart form.

Fitzgibbons Boiler Co., Inc.

**51—Central Air Conditioning**

Engineering catalog with illustrative and descriptive information and complete selection data on central plant conditioners, multizone conditioners, sprayed coil units, heating-ventilating units, cooling and heating coils. This catalog is notebook type and is index tabbed for easy and quick use.

Thermal Engineering Corp.

**52—Curtain Wall Air Conditioners**

Bulletin PW-281 describes a curtain wall system for modern motels. Streamlined in appearance, this curtain wall package includes window, curtain wall, door frame, and heat pump for heating, cooling, ventilating, and dehumidifying. Advantages, capacities, and dimensions are given. Available panel styles diagrammed.

Michael Flynn Manufacturing Co.

**53—Cabinet Electric Heaters**

Publication E-403 describes the completely new Nesbitt series E electric cabinet heater. A versatile, high capacity unit, it is styled with durable, good appearance for life-long beauty and trouble-free operation. Exclusive features provide completely safe operation and prevent overheating under all conditions.

John J. Nesbitt, Inc.

**54—Surface Unit Heaters**

Catalog 956 describes Grid cast iron steam heat transfer surface unit heaters, blast heaters, and radiators. Describes and illustrates one-piece construction. Included are air distribution charts, heating capacities, conversion tables, and specifications. This four-section catalog with tab index is well illustrated.

D. J. Murray Manufacturing Co.

**55—Air Handling Products**

Bulletin B-5188S offers Westinghouse-Sturtevant line of air handling products and electronic air cleaners. Apparatus listed for heating and ventilating, industrial processing, cooling and dehumidifying, and electronic air cleaning. All equipment is illustrated photographically.

Westinghouse Electric Corp., Sturtevant Div.

**56—Space Heaters**

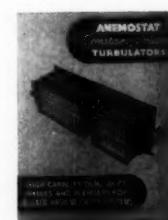
Catalog 2659 illustrates and fully describes how to effectively space heat in buildings with high ceilings. Sixteen pages include technical data, mounting heights, spread circle diameters, unit capacities of 30 sizes, specifications, and dimensional drawings. Complete charts, tables, and graphs included.

Young Radiator Co.

**57—Air Conditioning, Refrigeration**

Bulletin RS2D covers the entire line of air conditioning and refrigeration products. Range of sizes, specifications, and general description is given for each item. Items covered are packaged air conditioners (air and water cooled), packaged liquid chillers, room air conditioning coils, and others.

Curtis Manufacturing Co.

**58—Turbulator Units**

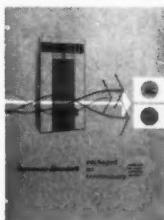
Air-conditioning consultants and building managers will be interested in the new line of turbulators for zone control of air conditioned buildings. Anemostat turbulators are high-capacity 800 to 7000 cfm units with special air valves and mixing vanes built as a package, for installation in a high-velocity system.

Anemostat Corporation of America.

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DIRECTORY OF ADVERTISERS' LITERATURE

AIR CONDITIONING, HEATING and VENTILATING continued



59—Packaged Air Conditioners

Bulletin 8525 describes American-Standard's packaged air conditioners in sizes and types for every air conditioning need. Photograph with keyed captions show various components. Complete specifications for each model, both air cooled and water cooled. Drawings show layouts for single rooms and entire buildings. *American-Standard, Industrial Division.*



60—Air Conditioner-Dehumidifier

Bulletin 140 describes means of precise manipulation of humidity and temperature, air-conditioning critical processes or drying and holding heat-sensitive materials, using absorbent liquid to dry air at moderate temperature without refrigeration. Diagrams, photos, chart of dehumidification, units up to 20,500 cfm. *Niagara Blower Co.*



61—Roof Ventilators

Catalog FA1 describes the all new Fiber-Aire roof ventilators by Swartwout. Here is a new fiberglass centrifugal unit (belt or direct) that actually absorbs noise, setting a new standard for ventilator quietness. Virtually impossible to dent or break and unaffected by salt spray, weather, fumes, and most chemicals. *Swartwout Co.*



62—Multi-Space Air Conditioners

Catalog EM-59-2114 describes revolutionary induction unit system of air conditioning for multi-story, multi-space buildings. System especially suited to curtain wall type construction or building with large glass area. Includes system features, cost comparison, and diagram of system piping. *York Corp.*



63—Low Silhouette Ventilators

Twenty-page technical manual contains helpful information in planning ventilation for commercial, industrial, school, and institutional buildings. Lists a complete line of low-silhouette, all-aluminum ventilators in capacities to 38,350 cfm. Also includes a new prefabricated curb for roof ventilators, in 12 sizes. *Loren Cook Co.*



64—Louvers

Bulletin SPV-17B describes and pictures 39 standard sizes of adjustable wall louvers, fixed louvers, combinations of the two types, and automatic units. Louver operators, screens, installation and construction specifications are also covered. Special louvers to your specifications can be supplied promptly. *Burt Manufacturing Co.*



65—Gas Powered Air Conditioning

"Gas Powered Air Conditioning" describes refrigeration and dehumidification cycles for commercial, industrial, and residential buildings. Includes data on characteristics, application, and economic considerations. For the guidance of the consulting engineer, specifications for the various systems are given. *American Gas Association.*



66—Centralized Controls

Bulletin 76-4569 covers Honeywell's new modularized approach to centralized operation for air conditioning systems. Shows how engineers build up complete Supervisory Data-Center from basic units and how Selectographic approach provides visual supervision and direct control of sub-systems. Specifications. *Minneapolis-Honeywell Regulator Co.*



67—Roof Ventilators

Bulletin 246 describes the new Peerless Electric Spun Roof Ventilator. Performance table includes model numbers, hp ratings, rpm information, wheel diameters, and cfm capacities. Applications, general construction features, optional features, ratings, and motors are discussed. Dimensions in easy-to-read table. *Peerless Electric Co.*



68—Space Heaters

Bulletin 580-12 explains how the new "industrial series" of the Dravo Counter-flo space heater is designed to solve problems relating to comfort heating, ventilating, process drying, tempering make-up air, and heat curing. Specifications are given for the 8 models ranging up to 2,000,000 Btu/hr. *Dravo Corp.*



69—Water Coils

Bulletin R-50 describes and illustrates Aerofin type R removable-header water coils. These are cleanable-tube extended-surface coils for cooling air with water. Principal advantages are easy cleaning of tubes and positive drainage. Engineering data for various pass arrangements are given to assist in selection. *Aerofin Corp.*



70—Air Conditioning Fittings

Catalog 35-8 provides illustrative and descriptive information and complete selection data on Carrier Spira-pipe, fittings and accessory items for heating, ventilating, and air conditioning systems. This is a complete sheet metal specialty guide to help save time and money on air distribution and material handling jobs. *Carrier Corp.*

AIR CONDITIONING, HEATING and VENTILATING continued**71—Air Conditioning Data File**

A new high velocity data file is designed to help the air conditioning industry utilize the advantages of high velocity air transmission and distribution. It discusses what high velocity is, what it can do, and where it should be used, duct design, duct construction, and temperature control.

Barber-Colman Co.

**72—Packaged Scotch Boilers**

Catalog 1016 describes the new line of *Bonnie Scot* packaged scotch type low pressure steam and hot water generators from National-U. S. Radiator. Offered in 5 models from 30 to 60 hp with net ratings from 499,000 to 1,498,000 Btu/hr. Units are available for oil, gas, or combination firing.

National-U. S. Radiator Corp.

**77—Three-Pass Boilers**

Bulletin B-3240 describes the Titusville Titan 3-pass units for power and heat. They are precisely engineered to meet the most exacting mechanical and thermal specifications. Mechanical and thermal features are listed. Illustrations show the boiler with various types of burners available. Certified results in chart form.

Titusville Iron Works Co.

**78—Power and Gravity Ventilators**

Bulletin SPV-101-G contains design, structural features, performance, and dimension data for Burt's complete line of power and gravity ventilators and automatic wall louvers. Burt axial flow airfoil fans, fan motor housings, motors, bases, dampers, and controls are also detailed in this complete catalog.

Burt Manufacturing Co.

**79—Air Source Heat Pumps**

Bulletin EM59-2128 describes the York factory assembled compound air source heat pump. Wide capacity range, 50 to 150 tons cooling, up to 1200 mbh heating at 0 degrees F. Dimensions for compressor and outdoor air unit given. Complete description of the system as well as the components. Specifications included.

York Corp.

**73—Electric Heating Guide**

Booklet B-3768-C, "Westinghouse Electric Heating Design Guide", has been prepared to assist in the proper application of electric heating. Various subjects covered are heating fundamentals, estimating cost, determining heat requirements, adequate wiring, and controls. Charts help figure heat losses.

Westinghouse Electric Corp.

**80—Unit Ventilators**

Colorful Publication 10-5T completely describes the newly developed Nesbitt Electric Syncrétizer Unit Ventilator. Capacities, details, dimensions, and construction features are given in this 8-page catalog. Economies and advantages in using electricity as a fuel in school heating and ventilating outlined.

John J. Nesbitt, Inc.

**74—Packaged Boilers**

The Burnham scotch type packaged boiler incorporates a proven design with performance and capacity-tested boiler and burner for oil, gas, or combination gas and oil firing. Shipped as a complete unit, it is available in 8 sizes, certified ratings from 4740 to 12,750 sq ft EDR steam. Engineering details given.

Burnham Corp.

**81—Cooling Towers**

Towers For Industry — bulletin 4.9.080A — discusses the structural and mechanical features of Pritchard induced draft, counter flow cooling towers. Drawings include cross-sections, a cutaway, and other detailed drawings. Photographs accompany drawings of most features. Dimensional diagrams are shown.

J. F. Pritchard & Co. of California.

**75—Packaged Boilers**

Type C Superior Packaged Boilers for capacities from 20 to 350 bhp are described in this 3 color catalog. Unusually compact, providing economies of installation, the Type C has four-pass design, 5 sq ft of heating surface per bhp, and induced draft. Data and dimensions for units to burn oil, gas, or both.

Superior Combustion Industries, Inc.

**82—Space Heaters**

Twelve-page bulletin describes OG-4 new design space heater. Gas, oil, or combination dual fuel burners with push-button changeover. Output from 280,000 Btuh on up. Rugged construction with completely enclosed burner adaptable for space heating, ventilation, make-up air, process heating, air conditioning.

Lennox Industries, Inc.

**76—Roof Exhausters**

Bulletin 58-HC illustrates features of new Jenn-Air Hi-D centrifugal belt drive all-aluminum power roof exhausters. Offered in 46 sizes with capacity ranges from 1085 cfm to 21,400 cfm featuring ball-bearing totally enclosed motors and full ball-bearing tubular drive assemblies. Bulletin is illustrated.

Jenn-Air Products Co., Inc.

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DIRECTORY OF ADVERTISERS' LITERATURE

AIR CONDITIONING, HEATING and VENTILATING continued

83—Estimating Fuel Consumption

Another in the series of Fuel Engineering Data Sections is available, describing four methods of estimating annual fuel consumption for heating loads based on the cost of construction, floor space, building volume or the heat loss schedule. Bulletin contains nine tables to simplify estimating fuel consumption.

Bituminous Coal Institute.



84—Industrial Fans

Bulletin 585 describes newly designed general industrial fans incorporating advanced aerodynamic techniques. The new fan combines improved efficiency with all the advantages of the flat radial blade design. Three wheel types are offered; diameters from 10 to 78 inches; capacities from 203 to 72,865 cfm.

New York Blower Co.



85—High Velocity Air Valves

Described and illustrated is *Pneumafoil*, a new high velocity air valve that uses no motors or linkage mechanism. Unique pneumatic actuation, positive operation by 15 psi system, adaptability to dual duct systems, and other features are described. Isometric drawings show pneumatic function. Dimensions, capacities.

Connor Engineering Corp.



86—Multi-Zone Air Conditioning

First complete reference data on design and layout for multi-zone installation practice. Text, 24 pages, covers construction details, design procedures, basic air distributing schemes, air handling apparatus, budget costs, automatic control, winter and intermediate operation, specifications. Valuable for the designer.

Buensod-Stacey, Inc.



87—Steam Heating Coils

Catalog 59C9a, revised, gives complete information on steam coils for heating applications, non-freeze for low entering air temperature, heavy duty for service over 30 psi steam pressure, and low capacity for reheat or tempering duty. Complete selection data is provided in this catalog.

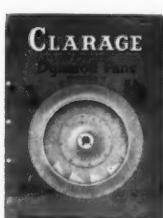
Recold Corp.



88—Airfoil Blade Fans

Catalog 859 describes a new line of highly efficient, quiet airfoil blade fans. Dynafoil fans are particularly applicable to mechanical draft and heavy duty applications, such as industrial processes, conduit air conditioning, and tunnel ventilation. Various arrangements and panel openings pictured. Dimensions given.

Clarage Fan Co.



89—Packaged Air Conditioners

Catalog 571 describes the new line of Model ASC packaged air conditioners from Acme Industries. Offered in sizes from 3 through 15 tons, the units are completely self-contained, air or water cooled, and are easily installed with or without duct work. Complete selection data and specifications.

Acme Industries, Inc.



90—Gas Fired Boiler-Burner Units

Catalog JR-10-2-G describes a new gas-fired boiler-burner unit. Furnished with accepted pressure type gas burner for medium sized automatic gas-heating installations in ratings for steam and hot water, 427,000 to 1,928,000 Btu/hr guaranteed gross output. Tankless domestic hot water coils available.

Fitzgibbons Boiler Co., Inc.



91—Squirrel Cage Fans

Design 3 Catalog 250 presents the Peerless "Massachusetts" line of squirrel cage fans. Contains information on housing wheels, bearings, inlet vanes, and rotation and discharge arrangements. Accessories are discussed. Illustrated with photographs and diagrams. Sizes, dimensions, features, and specifications.

Peerless Electric Co.



92—Evaporative Condensers

Bulletin 50 describes line of Marlo evaporative condensers, in three types — horizontal, vertical, low silhouette — 20 sizes, capacities 3 to 250 tons. Bulletin includes photographs, drawings, construction features, performance charts, ratings, and specifications. Additional data also is included in this 24-page bulletin.

Marlo Coil Co.



93—Axial Flow Fans

Bulletin 740 describes Type CB belt-driven axial flow fans for use in power plants, auditoriums, stores, factories, or wherever large volumes of air must be moved at relatively low noise levels and moderate pressures. Available in four sizes from 42 to 72 inches. Certified ratings from 14,200 to 58,100 cfm.

Robbins & Myers, Inc.



94—Roof Ventilators

New 16-page Colt catalog describes clear opening "CO" ventilators. Fit any type of roof for quick release of concentrated process heat — with special attention to fire control through use of automatic fusible link louvers. Specific installation instructions included. Catalog also available on "GP2" inlet ventilators.

Colt Ventilation of America, Inc.



AIR CONDITIONING, HEATING and VENTILATING continued**95—Central Air Conditioners**

Catalog 7558 gives performance, capacity, and dimensional data required to select proper size unit for given installations as well as selection example. Capacities range from 700 cfm to 28,000 cfm. Horizontal and vertical arrangements offered in 10 sizes — multizone units in 9 sizes, selection of 2 to 21 zones. *Young Radiator Co.*

**96—Bifurcator Fans**

Catalog DB-37-55, 16 pages, describes operation of the bifurcator fan, a split-housing fan that exhausts hot, corrosive, and flammable fumes. Use of the bulletin makes fan selection easy since it gives full data on fan laws and static pressure, velocity pressure, and friction. *DeBothezat Fans, Division of American Machine & Metals, Inc.*

**97—Unit Ventilator Controls**

New 8-page planning guide for consulting engineers covers the 3 important cycles for all leading types and models of unit ventilators. The booklet includes new face and by-pass units, and incorporates complete set of specifications and diagrammatic drawings for each. Tab permits easy reference in file. *Barber-Colman Co.*

**98—Central Air Conditioners**

New bulletin AC-121 gives complete data on "Buffalo" Model G central station air conditioning cabinets. Type PC for horizontal floor or ceiling installation, type UPC for vertical operation, type PCW spray coil for horizontal operation, type VPCW spray coil for vertical operation. Details on performance data. *Buffalo Forge Co.*

**99—High Velocity Ducts**

Special 24-page manual contains 11 pages of performance tables; explains step-by-step computations on two work sheets for 10-story office building; shows schematic layouts; information on duct construction and duct insulation. Also included are tables of static regain and transition loss and elbow losses. *Anemostat Corporation of America.*

**100—Gas-Fired Heating Equipment**

Bulletin A1/1.2A covers a complete line of gas-fired commercial and industrial heating equipment with capacities from 25,000 to 2,000,000 Btu. Includes fan and blower type suspended unit heaters, heavy duty space heaters, and sectional duct furnaces with matching cabinet blowers. Dimensions, specifications. *Reznor Manufacturing Co.*

**101—Air Diffusers**

Catalog R-107 describes the Agitair line of square and rectangular air diffusers with built-in diffusing vanes which provide 64 active air jets to every square foot of the unit. Diffusers are custom-made in unlimited air pattern arrangements. Contains complete performance, selection and application data. *Air Devices Inc.*

**102—Curtain Wall Air Conditioners**

Bulletin PW-260 describes a new concept of curtain wall function, room-by-room air conditioning, an integral part of the Lupton curtain wall system. This is a true perimeter type system affording individual room control. It is a space saver and is easily installed. Includes capacities, dimensions, and specifications. *Michael Flynn Manufacturing Co.*

**103—Roof Exhausters**

Bulletin 100-1959 describes Ammerman's PB and BCD AirXpeler power roof exhausters fabricated of aluminum or molded reinforced fiberglass. Offered in a large variety of sizes and speeds. Gravity or fresh air intakes available. Catalog illustrated with photographs and diagrams. Complete specifications included. *Ammerman Co., Inc.*

**104—Evaporative Condensers**

Catalog AC-1001 describes the new line of packaged CEN units for water cooled and evaporative condensers for commercial, institutional, and industrial applications. Consisting of three basic sections, condenser section, compressor section, and condensing section, models are available ranging from $7\frac{1}{2}$ through 60 hp. *National-U. S. Radiator Corp.*

**105—Gravity Roof Ventilators**

Completely new 8-page Bulletin PAR-59 describes in detail the Pul-Air ridge continuous gravity roof ventilator. Contains intricate drawings on mounting variations, damper types and operation. Listed are standard sizes, weights, and accessories. Actual installation photographs are included. *Penn Ventilator Co., Inc.*

**106—Belt-Driven Fans**

Bulletin 450 describes belt-driven vaneaxial fans, for maximum efficiency against high static pressures. Units overcome swirl or turbulence in duct systems with propellers and guide vanes that counteract torque and pass air through in a straight stream. Sizes 12- to 60-in., capacities to 47,000 cfm. *Aerovent Fan Co., Inc.*

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ELECTRICAL EQUIPMENT

107—Power Protector

GEA-6527 describes the LB-1 power protector designed for heavy duty service entrance applications on 240v and 480v systems with available short circuits up to 200,000 rms amperes. A coordinated switch and fuse unit, has overload switching ability designed to break up to 12 times rated current.

General Electric Co.



108—Explosion-Proof Reels

Bulletin EXR 259, a 4 page bulletin listing of various explosion-proof type reelites. Reelites are an automatic cable take-up mechanism for supplying current to moving objects. Supplies complete catalog listing, cable lengths, maximum conductors, and cable sizes of all explosion-proof Reelites.

Appleton Electric Co.



109—Distribution Systems

Rome Cable's new primary distribution system, *Trimline*, is described and fully illustrated in a new free bulletin, RCP-790. A discussion of when and where to use the system plus descriptions of its components accompany the technical data. Information on installation and sample specifications are included.

Rome Cable Corp.



110—Dimmerboard Systems

This 24-page bulletin explains basic components of stage dimmerboard systems, as well as optional components and features. Complete description of standarized dimmerboards, plus convenient selection chart. Specifications for all types of dimmerboard systems and layout dimensions are included.

Square D Co.



111—Terminating, Splicing Fittings

"O.Z. Terminating and Splicing Fittings for Interlocked Armor Cable," 36-page engineering bulletin 135A, gives complete specifications, dimensions, cutaway drawings, photographs, and installation instructions. Prices and weights also are given for each item, along with ordering data and available materials.

O. Z. Electrical Mfg. Co.



112—Relays

Bulletin 5-050 offers information on Type CDG relays in 3 designs: inverse, very inverse, extremely inverse. Intended for use by utility and industrial companies in controlling the distribution of electricity. This 16 pp. bulletin includes illustrations, dimension drawings, wiring diagrams, and current curves.

Federal Pacific Electric Co.



113—Battery Chargers

Compact, vertically-mounted motor-generator battery chargers saving up to two thirds on floor space described in Bulletin 6259. By mounting the simplified design, lightweight chargers overhead on pillars or walls, floor space requirements are eliminated.

Exide Industrial Division
Electric Storage Battery Co.



114—Bus Duct Layout

Booklet B-4272C is designed for consultants' use in planning and selection of units for bus duct layout in commercial, institutional, and industrial buildings. Plug-in duct, outdoor feeder duct, low-impedance duct, and *Life-Line* busway are fully covered. Completely illustrated with engineering and test data.

Westinghouse Electric Corp.



115—Motors and Generators

Bulletin 43-205 contains product information on high speed and low speed synchronous motors and generators. Looseleaf form, punched for three-ring binder. Gives information on low speed, high speed, and vertical-type construction, insulation, and excitors. All pages fully illustrated. Pictures of installations.

Electric Products Co.



116—Continental Wire Facilities

"The Four Minute Tour" is a word and picture trip through the facilities and offices of Continental Wire. It points out some of the machines and operations used to make insulated wire and cable: taping heads, extruder, winder, braiding machinery, carders, varnishing towers, and types of inspection at each point.

Continental Wire Corp.



117—Power Switchgear

Bulletin 1616A describes construction, standard assemblies, and standard components for power switchgear with fused and unfused interrupter switches. Metal enclosed units are grouped with common bus, providing flexible arrangements. Operation of switches explained with accompanying operational illustrations.

I-T-E Circuit Breaker Co.



118—Diesel Generating Plants

Four-page folder F-142 describes the complete line of Onan diesel electric generating plants. Offered in a variety of models 3,000 to 6,000 watts, with Vacu-Flo cooling; 10,000 to 230,000 watts water-cooled. Diesel-driven marine electric plants for below-decks service also listed. All standard voltages.

D. W. Onan & Sons Inc.



ELECTRICAL EQUIPMENT continued

**119—Motor Controls**

Catalog 7000, 133 pages, gives detailed technical data, dimensions, prices of a full line of motor controls. A new catalog numbering system replaces old style numbers, enables customers to write one-line order because all pertinent information is now found on a single page. Cross-indexed. Includes handy selection guide.

Westinghouse Electric Corp.

**120—Magnetic Drives**

Catalog 243 details the line of magnetic drives from Electric Machinery Mfg. Co. The drive is offered in 5 models from 10 hp to 300 hp. Complete with controls, the drives provide quick, smooth, ac speed changing. Automatic speed control is another feature. Complete selection data and charts are provided.

Electric Machinery Mfg. Co.

**125—Motor Controls**

Motor Control Catalog 14 indexed for easy reference to manufacturer's complete line of motor controls and accessories, including complete size, weight, and ratings information, wiring diagrams, dimensional drawings, and prices. One section lists parts available; another contains heater tables and motor charts.

Arrow-Hart & Hegeman Electric Co.

**126—Electrical Equipment**

New 20-page manual gives comprehensive specification data on Square D electrical equipment — safety switches, panelboards, switchboards, dimmerboards, control centers, bus duct, and substations. The manual also includes convenient reference guide to National Electric Code requirements.

Square D Co.

**121—Interrupter Switches**

Bulletin 1610B describes and illustrates, arc chute type interrupter switches, fused and unfused, for switching feeder circuits. Usually metal enclosed, switch can be wall mounted or free standing, dimensions shown for both. Switches can close in on moderate faults. Diagrams show principal forms of switches.

I-T-E Circuit Breaker Co.

**127—Crouse-Hinds' Facilities**

Twelve-page pictorial bulletin 2706 briefly describes manufacturing facilities and electrical products of Crouse-Hinds. Emphasis is on variety of equipment in the four product lines; Conduit electrical equipment, floodlights, aviation lighting equipment, and traffic control. Photographs show products in use.

Crouse-Hinds Co.

**122—Electrical Raceways**

Bulletin SA-EMT-59 contains data on the complete line of Republic electrical raceways. Exclusive features and various design data are shown. Products included are *Electrunite EMT* (Electrical Metallic Tubing), rigid threaded steel conduit, plastic coated EMT and rigid conduit, plastic pipe and other products.

Republic Steel Corp.

**128—Bus Duct**

Bulletin 3-125, illustrated review of Federal Pacific's line of plug-in and low impedance bus duct. Contains detailed descriptions on straight sections, fittings, and protective devices. Included are construction details of plug-in duct (225-1000 ampere) and low impedance (600-5500 ampere). Fully illustrated.

Federal Pacific Electric Co.

**123—Terminals and Splices**

Catalog 320 illustrates over 300 quick-connect terminals and splices for appliance, automotive, and other equipment wiring. The booklet contains test data, dimensions, and applications. Complete details of high speed pneumatic and electric wire terminators for mass production of leads and harnesses included.

AMP Inc.

**129—Power Cables**

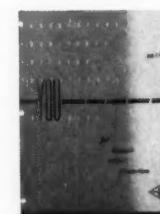
This 40-page bulletin gives a full description of Anaconda's complete line of rubber-insulated power cables. Constructions range from 600 to 15,000 volts and every type of dimensional data is furnished in this booklet. Also included are capacity and installation data, as well as instructions on how to order.

Anaconda Wire & Cable Co.

**124—Unit Substations**

If you need system reliability, substation flexibility, engineering by builder, unified responsibility and billing, small space requirements, neater appearance, easy installation, simplified maintenance, ordering ease, you need Master Unit Substations. Bulletin GEA-3800D shows how to meet these requirements.

General Electric Co.

**130—Circuit Breakers**

"What You Should Know About Circuit Breakers for Branch Circuit Protection," 16-page manual 101, describes ways of protecting your client from fire, equipment damage, excessive wiring costs, and needless circuit interruptions. How hydraulic-magnetic circuit breakers provide this protection is pointed out.

Heinemann Electric Co.

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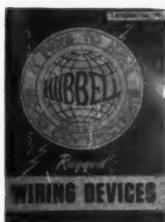
ELECTRICAL EQUIPMENT continued



131—Circuit Breakers

Bulletin 4261-2B describes I-T-E's new *U-Re-Lites*, individually enclosed low voltage power circuit breakers. Information includes design, safety features, enclosure dimensions, selection chart, application data, and coil ratings. All features are illustrated photographically, as well as installation procedures.

I-T-E Circuit Breaker Co.



132—Electrical Wiring Devices

Electrical Wiring Device Catalog 29 describes and illustrates Hubbell's complete line of connecting devices, switches, and plates. Also included are lampholders and sockets, interchangeable devices, fluorescent lampholders and starters. Wiring diagrams, charts, and product installation photographs included.

Harvey Hubbell, Inc.



133—Polyphase Motors

Bulletin MU-230 describes tube ventilated polyphase motors available in totally enclosed models with Class A or B insulation and explosion-proof models with Class B insulation in ratings of 250 to 500 hp. Tube type heat exchangers provide efficient cooling for motors used to drive fans, blowers, and pumps.

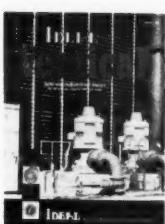
Wagner Electric Corp.



134—Universal Switchboards

Bulletin GEA-6627 completely describes the features of General Electric's new Type DR universal switchboard. Also includes detailed descriptions of all types of Type DR component devices plus layout and dimensional information. Switchboard is suitable for maximum 600-volt, ac, 250-volt, dc, service.

General Electric Co.



135—Squirrel Cage Motors

Bulletin 219 describes Ideal hollow and solid shaft squirrel cage induction, synchronous, and wound rotor motors in frames 584 and larger, 150 hp and up, for diversified requirements and conditions. Bearing and coupling sizing and selection data, sample specifications, and typical Ideal installations are included.

Ideal Electric & Manufacturing Co.



136—Stab-In Units

Bulletin 1-215A describes Federal Pacific's new line of Type SF Stab-in fusible service equipment. Covers stab-in units, enclosures, features, and typical applications. Primary features are flexibility, economy, and ease of installation. Ten enclosures and 5 stab-in units replace 208 previous devices.

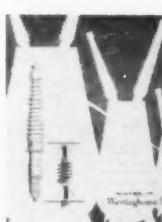
Federal Pacific Electric Co.



137—Dry Type Transformers

Bulletin 100A contains, in table form, complete statistical information on Hevi-Duty single phase, dry type, insulating transformers, .050 to 500 kva, for power and lighting circuits. Photographs, dimension drawings, capacities, prices, temperature rise, weights, and dimensions are given for each transformer listed.

Hevi-Duty Electric Co.



138—Circuit Protection

Newly released 20-page bulletin B-7232, discusses "The Search for Perfection in Circuit Protection." Bulletin also includes complete system protection, science of circuit breaking, solenoid and pneumatic operating mechanisms, oil breakers, arc interruption, and measurement of interrupted current.

Westinghouse Electric Corp.



139—Electric Cables

Bulletin 1032 deals with electric cables for high temperature operation. Contains applications, heat resistance charts, current carrying capacities, and specifications on Simconex, Simplex silicone insulated cables. These cables operate at temperatures up to 200°C and retain flexibility at very low temperatures.

Simplex Wire & Cable Co.



140—Motor Controls

This condensed catalog lists, with prices, all commonly used motor controls up to and including size 4 rating. Standard enclosures are shown. Also included are various types of starters, transfer switches, control relays, push button stations, and other controls. Catalog is illustrated, includes list of renewal parts. *Allen-Bradley Co.*



141—Single, Multi-Speed Starters

Describes single and multi-speed starters, including combination and reversing starters, plus Square D Spin Top enclosures for hazardous locations. Also describes motor control racks for field mounting of Spin Top enclosures and other equipment. Bulletin includes price and dimension information.

Square D Co.



142—Emergency Controls

Catalogs 57-S6 and 57-S1 describe emergency controls for standby electric plants. Included in 57-S6 are automatic engine starting controls, load demand controls, battery chargers, gasoline engine remote control units, and paralleling, changeover and alternating panels. Automatic transfer switches in 57-S1. *Automatic Switch Co.*

ELECTRICAL EQUIPMENT continued

143—Protective Relays

Catalog 5-020 describes Federal Pacific's complete line of protective relays. Featured are 15 models of protective relays, representing 8 different types. Tabular data, special features, design, settings, burdens at 60 cycles, contacts, and case given. Photographs and descriptive material detail its application.

Federal Pacific Electric Co.

**144—Protective Fuses**

Bulletin HCS tells how Buss Hi-Cap fuses have unlimited interrupting capacity on any voltage up to 600 to provide safe protection for loads above 600 and up to 5000 amperes. Describes operating characteristics and advantages, illustrates dimensions, contains charts on current limiting effect and opening times.

Bussmann Mfg. Div., McGraw-Edison Co.

**145—Community TV Systems**

Bulletin M-50-49 describes Blonder-Tongue Masterline equipment for multi-set operation in master and community TV systems. Consists of the main folder, an article on installing master TV systems in motels, catalog sheet of specifications, and price list. Bulletin is illustrated, includes amplifier specifications.

Blonder-Tongue Laboratories, Inc.

**146—Electric Plants**

Catalog KEP56-1, 24 pages, shows the line of Kohler electric plants used as an independent source of electricity for sole supply and for automatic standby when central station power fails. Sizes range from 500 w to 50 kw, gasoline and diesel. Battery charging units in 6, 12, 36, and 140 v capacity are described.

Kohler Co.

**147—Electrical Power Distribution**

Catalog SM-244, 16 pages, describes in detail the modern method for centralizing electrical power distribution and motor control equipment for industrial applications. It also contains suggested ideas for control specifications, and gives a simplified selector for use in control center layout and planning.

Square D Co.

**148—Saturable Reactors**

Bulletin 658 illustrates and describes Sorgel saturable reactors to control, regulate, and vary electric power from 1 kva to 3000 kva, for various manufacturing processes, either manually or automatically. Also includes a questionnaire form to fill in to obtain complete information for any application.

Sorgel Electric Co.

**149—Cable, Wiring, and Tubing**

Two systems of support for all types of cable, wiring, and tubing are described in a 28-page illustrated catalog. Systems are engineered to be used interchangeably, depending on the weight of the load to be supported at any location. Globetray, the ladder-type tray, and cable-strut, the basket type, described. Globe Co.

**150—Pushbuttons**

This complete guide, B-6749A, contains illustrations, application data, dimensions, prices, and circuit wiring information on a complete line of Westinghouse pushbuttons. Included are Oil-tite, standard-duty, and heavy-duty pushbuttons and enclosures, as well as accessories for all units in this 80-page booklet.

Westinghouse Electric Corp.

**151—Wiring Devices**

Catalog 60, 75 illustrated pages, describes complete range of electrical wiring devices. Both the interchangeable Despard line and the P&S conventional line. Everything from switches to fixtures to devices for every purposes are listed. A 15-page index and price list are also included in this catalog.

Pass & Seymour, Inc.

**152—Substation Arrangements**

Bulletin 3025 shows in diagrams six different substation arrangements available from Moloney. Shown are single and double circuit with bus disconnects, bus and load disconnects, and bus and load disconnects and by-pass. The specific advantages of this type of substation construction are pointed out.

Moloney Electric Co.

**153—Electrical Conduit**

Bulletin KE 1058 lists physical, thermal, and electrical data for nonconducting Kraloy PVC (polyvinyl chloride) electrical conduit, with photographic installation details. Specifications for thin wall conduit ($\frac{1}{2}$ to 2 in.) and standard wall conduit ($\frac{1}{2}$ to 4 in.), all connections, couplings, and fittings are included.

Kraloy Plastic Pipe Co., Inc.

**154—"Telemand"**

Bulletin 5047-1A covers design and operational features of newly developed motor operated device, trade named Telemand, which allows remote control of opening, closing, or resetting molded case circuit breakers. Photos, application, operational drawings, and installation data provided.

I-T-E Circuit Breaker Co.



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ELECTRICAL EQUIPMENT continued

155—Feed-In Duct

Bulletin SD-101 describes in detail Square D totally enclosed low-impedance aluminum feed-in duct. Also explains how telescopic joints eliminate need for special lengths and demonstrates the safety, space-saving, and mounting features of Square D feed-in duct. Includes suggested specifications. *Square D Co.*



156—Receptacle Openings

These charts, diagramming the approved and standardized receptacle openings and plug blade arrangements of 28 different types of polarized, non-polarized, and grounding devices for 2-, 3- and 4-wire installations, are offered in 17 x 22 in. wall size and 8½ x 11 in. page size. Devices cover a complete range. *Arrow-Hart & Hegeman Electric Co.*



157—Silicone Insulated Motors

Bulletin 1C-106, "Specify Silicone Insulated Motors and Transformers and Save" describes several ways to save on initial equipment, installation, and maintenance costs. Five ways in which major manufacturers are using silicone insulation systems in improved equipment designs are also reviewed. *Dow Corning Corp.*



158—Centralized Circuit Control

This descriptive 52-page bulletin 32-250, covers centralized circuit control and protection for generators, motors, bus, and feeders up to 13.8 kv. A complete line of functional units available as standardized assemblies in any combination to meet specific requirements. Includes outstanding design features. *Westinghouse Electric Corp.*



159—Metalclad Switchgear

New brochure describes components, applications, and performance of metal-clad switchgear, ratings to 500 MVA short circuit interrupting and 44,500 amp fault closing. Drawings show substation, switching center, and service entrance applications. Typical installations and construction shown. *S & C Electric Co.*



160—Continuous Power Systems

Bulletin 21-200 describes the Inverter-Divertor, the continuous ac and dc power system. It supplies standby power instantaneously without losing even a fraction of a cycle. Includes features, construction, and operation. Oscillogram shows transfer from normal to emergency operation caused by 10% undervoltage. *Electric Products Co.*



161—Brushless Generators

Bulletin 255 details a new line of brushless, ac generators. BEMAC, short for Brushless Excited Magnetic Amplifier Controlled, is a basic change in generator design, eliminating both commutator and slip ring brushes. Ratings available from 12.5-187 kva, single and three phase, 1200 and 1800 rpm. *Electric Machinery Mfg. Co.*



162—Compact Unit Substations

Bulletin 5604-1A describes *Tranfo-Units* for indoor or outdoor, ratings 45 through 2500 kva, primary through 14.4 kv, secondary through 600 volts. These units, completely pre-engineered load centers for stepping down primary voltages, contain transformer and its primary and secondary distribution devices. *I-T-E Circuit Breaker Co.*



163—Metallic Sheathed Cables

Bulletin 1031 contains questions and answers on Simplex's new sealed metallic sheathed cables. Simplex C-L-X is a continuous, lightweight, metallic cable sheath which is impervious to gases, chemicals, and water. Its construction, with a thermoplastic covering, gives a combination of unmatched properties. *Simplex Wire & Cable Co.*



164—Panelboard Circuit Breakers

Bulletin 3103 covers the Heinemann series 0911, an economical panelboard circuit breaker dimensionally interchangeable with other makes. Available in 1- and 2-pole models, 0.050 to 60 amperes, the 0911 uses hydraulic-magnetic actuation to end heat-induced nuisance tripping. Fast short-circuit interruption. *Heinemann Electric Co.*



165—Secondary Unit Substations

Detailed information on secondary unit substations — complete and compact load distribution centers for indoor or outdoor applications — in bulletin 3104-1A. Gives data and specifications on a large variety of primary devices, transformers, and secondary switchgear offered in I-T-E secondary unit substations. *I-T-E Circuit Breaker Co.*



166—Power Cables

Catalog J-942 describes a new development consisting of three single conductor, parallel-laid, insulated, 5 kv power cables, supported from a messenger by a plastic spacer. Method combines the advantages of both open wire lines and insulated cables. Data on design, operation, installation, splicing, and tapping. *John A. Roebling's Sons Corp.*



ELECTRICAL EQUIPMENT continued

167—Fusible Panelboards

Bulletin 3-230 describes QMQB fusible panelboards from 30 to 1200 amps, 250 to 600 volts. Were developed to meet the increased power of electrical distribution systems. Features are visible blade contacts, dionizing arc quenchers, and high pressure fuse holders. Panelboard selection data included.

Federal Pacific Electric Co.

**168—Wire and Cable**

"Wire & Cable for American Industry," 72-page catalog, gives construction specifications for all types of wire and cable, such as: apparatus, appliance, audio, boiler room, building, coaxial, control, gasoline resistant, instrument, mining, power, railway signal, remote control, sheet lighting, and many other types.

Continental Wire Corp.

**169—Polyphase Motors**

Bulletin MU-224 describes the new line of totally enclosed polyphase motors from Wagner Electric Corporation. Included are standard and explosion-proof designs in NEMA frame sizes 182 through 445US, 1 to 100 hp. Bulletin contains selection data, motor dimensions, performance curves, and ratings.

Wagner Electric Corp.

**170—Switchboards**

This 72-page bulletin gives complete layout and specification information on Square D 14-in. switchboards. Separate sections on circuit breakers and fusible equipment for service and distribution systems. Contains detailed layout and dimension drawings, wire and conduit tables, and lists NEC requirements.

Square D Co.

**171—Electrical Controls**

Engineering reference catalog 18A contains a complete line of standard Zenith electric controls and timing devices. Photos, diagrams, engineering data, and prices on automatic transfer switches, magnetic contactors, remote control switches, program clocks, automatic reset timers, cycle timers, and special controls.

Zenith Electric Co.

**172—Load Tap Changing Equipment**

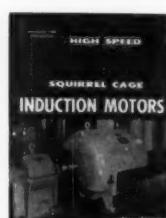
Bulletin LTC-2907 describes the operating principle of Moloney's load tap changing equipment incorporating an exclusive reactor, by-pass, switching principle. Applications are shown in pictures with accompanying circuit diagrams. General construction and that of various mechanisms are explained and illustrated.

Moloney Electric Co.

**173—Heavy Duty Connectors**

Folder illustrates and describes the "Hubbell" line of premium quality, heavy-duty electrical connectors, the dependable link between primary power source and electrical equipment. Dead front safety shutter eliminates danger of arcing and protects contacts from dirt, lint, and metal filings.

Harvey Hubbell, Inc.

**174—Induction Motors**

Bulletin 210 illustrates and describes large, high-speed Ideal squirrel cage induction motors from 100 to 5000 hp at speeds from 514 to 3600 rpm in frames 584 to 11320. Complete description of design and construction with individual photos of sub-assemblies and method of simplified maintenance and servicing.

Ideal Electric & Manufacturing Co.

**175—Aluminum Plug-In Busway**

Bulletin GEA-6173 completely describes the new General Electric Type DE aluminum plug-in *Flex-A-Power* busway. Describes unique one-belt joint, tubular aluminum conductors, and butyl insulated bus bars. Available in 3- or 4-wire systems for applications up to 600 volts, ac or dc. Specifications and installation data.

General Electric Co.

**176—Rectifier-Type Chargers**

New rectifier-type chargers are described in bulletin 6256. They provide the most accurate voltage control available for charging of stand-by batteries. Are for use in electric utility service, in emergency power, emergency lighting, and in other float-charge battery applications.

*Exide Industrial Division
Electric Storage Battery Co.*

**177—"Rocker-Glo" Switches**

Illustrated four-page brochure describes new *Rocker-Glo* switch by Pass and Seymour. It has a luminous button and operates silently. Available in 15 or 20 amp, 120/277 volts ac. It has easy-to-wire pressure or screw terminals. Comes in Despard type with strap or Despard interchangeable.

Pass and Seymour, Inc.

**178—Molded Case Breakers**

Compact pocket-size bulletin 5004-1A gives construction and performance features, ratings, and details on complete line of I-T-E molded case breakers by types, current ratings, overcurrent devices, accessories, and modifications available. Each model is illustrated in column over specifications.

I-T-E Circuit Breaker Co.

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ELECTRICAL EQUIPMENT continued



179—Conductor Plug-In Busway

Bulletin GEA-6172C gives description, application, selection, dimensions, ratings, weights, layout, and installation of GE's Type DH aluminum conductor plug-in busway and its accessories. Busway is available for 3-wire single-phase or dc, 3-wire three-phase or 4-wire three-phase applications, 600 volts, ac or dc.

General Electric Co.



185—Bus Fuse-Fuseholder

New Buss fuse-fuseholder combination for protection of individual fluorescent fixtures and other equipment on circuits of 300 volts or less. Bulletin SFH-6 tells how individual fusing reduces hazards of fires and explosions. Bulletin specifies the size fuse to use and where to locate it for the best protection.

Bussmann Mfg. Div., McGraw-Edison Co.



180—Wiring and Wiring Systems

Lower cost, reduced diameters, easier installation, improved performance with trouble-free long lasting service . . . are all descriptions of the modern industrial plant electrical system. Developments in these areas are discussed in the paper "Wiring and Wiring Systems Standards for Industrial Use", Bulletin RCT 102.

Rome Cable Corp.



186—Motor Control

Here is an excellent engineering reference book on the "Theory and Practice" of motor control. Subjects discussed in 40-page handbook 14X7988 include function and operation, maintenance, components, types of enclosures, and types of control for each motor type. A useful trouble shooting chart also is provided.

Allis-Chalmers.



181—Dry-Type Transformers

This bulletin 958A describes and illustrates Sorgel Electric Company's standard line of low sound level dry-type transformers in ratings of $\frac{1}{4}$ to 333 kva single phase and 1 to 10,000 kva three phase, 120 to 15,000 volts suitable for varied installations. Consultants will find the book valuable.

Sorgel Electric Co.



187—Metalclad Switchgear

Bulletin 2804-1A describes I-T-E's complete line of 4160-volt metal-enclosed switchgear. It covers standard indoor and outdoor and walk-in outdoor types of equipment, and gives construction and performance features and ratings and dimensions for each. A special section provides photos, sketches, and diagrams.

I-T-E Circuit Breaker Co.



182—Dry-Type Transformers

Bulletin 200 contains complete information about Hevi-Duty three-phase dry-type power and lighting transformers. Sizes range from 6 to 2000 kva. Illustrations, outline drawings, sound levels, capacities, prices, dimensions, weights, wiring diagrams, and temperature rise for each transformer are included.

Hevi-Duty Electric Co.



188—Plastic Conduit

Descriptive two-color brochure covers four types of plastic conduit for electrical and communications lines (underground or underwater), single or multiple applications. Sizes 2 to 6 in. are featured, with use data, and illustrated assembly methods emphasizing installation cost reductions up to 35%.

Southwestern Plastic Pipe Co.



183—Switchgear

Bulletin 3-440 gives feature-by-feature description of most modern design switchgear. Discussed are construction and operation of 5 and 15 air circuit breakers; indoor and outdoor housing construction, compartmentation, and simplified installation and maintenance. Ordering information, arrangements.

Federal Pacific Electric Co.



189—Engine Driven Electric Plants

Four educational pamphlets deal with complicated characteristics of engine driven electric plants. M-100 describes methods of excitation; B-101 compares running hours of operation between car and electric plant; M-102 discusses engine fuels; M-103 discusses operation of electric motors with generating sets.

D. W. Onan & Sons, Inc.



184—All-Purpose Control Cable

Bulletin DM-5844 gives full technical data on Anaconda's thermoplastic all-purpose control cable with polyethylene insulation, double Densheath (PVC) jackets. Offers 7-wire stranding, excellent electrical characteristics, easy installation. Resists chemicals, mechanical abuse, moisture, heat deformation.

Anaconda Wire & Cable Co.



190—Electrical Fittings

Loose-leaf catalog 135 has been prepared to provide all the technical information you need to select the right conduit fittings, cable terminators, cast iron boxes, and solderless connectors for each of your electrical installations. It includes a comprehensive index and a section of useful engineering data.

O. Z. Electrical Mfg. Co.

FIRE PROTECTION

191—Fire Check Book

Fire Check Book is designed as a handy reference for use in the selection and installation of non-sprinkler fire protection equipment. It shows the basic requirements for standpipe system, hose station, extinguisher, and exterior centers. Check Book includes coupon specifications forms which simplify spec-writing.

W. D. Allen Manufacturing Co.



192—Fire Ventilators

Pyrojectors open automatically in case of fire or explosion to vent heat, smoke, and gases up through the roof to prevent major destruction caused when solid roof spreads fire outward. Ruggedly constructed. *Pyrojectors* open at 212° F., air pressure over 10 psf or by manual operation. Complete engineering data. *Swartwout Co.*



193—Fire Pumps

Kit 08B8514 provides a wealth of information on fire pumps for motor, engine, or steam turbine drives. Package contains descriptions, catalog listings, performance curves, and engineering data on pumps to 2500 gpm, 3500-ft head. Also includes booklets on related equipment such as control, motors, and engines. *Allis-Chalmers.*



194—Fire Extinguishing Systems

Catalog S-62 covers Fyr-Fyter's nine major brands of interior fire extinguishing systems, portable extinguishers, cabinets, and other inside fire control products. Considered one of the most comprehensive product information guides of its type ever published, it is particularly useful to consulting engineers. *Fyr-Fyter Co.*



195—Protective Asbestos Coating

Bulletin SL-8 describes fire-protection, acoustical control, anti-sweat, and heat-saving properties of sprayed *Limpet* asbestos, a simple sprayed-on blanket of 100% asbestos which adheres to all interior surfaces without hiding decorative details. Up to four hours fire-protection provided to beams and floors. *Keasbey & Mattison Co.*



196—Standpipe Units

First major improvement in thirty years in standpipe fire protection units is completely illustrated and described in this four-page folder. Features hose storage rack on door for increased fire-fighting efficiency. Unit saves wall space. Lower installation costs, lower price, Underwriters' approved. *W. D. Allen Manufacturing Co.*



HEAT EXCHANGERS and WATER HEATERS

197—Commercial Water Heaters

"Water Heating for Commercial Kitchens" is a guide to proper sizing, selection, and installation of gas-fired water heating systems. Describes various types of dish-washing equipment, including arrangements and sizes of water heating apparatus. Data on water and gas piping, venting, and required clearances. *American Gas Association.*



198—Lined Water Storage Tanks

Sims Co. of Erie, Pa., has prepared a condensed catalog describing copper lined, plastic lined, and cement lined tanks. Included are capacity data for sizes from 53 to 6570 gallons; dimensions, weights, pressures (75-100-125-150 lbs wp), and prices. Cost of linings listed separately. *Sims Co.*



199—Thermo-Panel Coils

Prices and data on Dean *Thermo-Panel* coil which takes the place of pipe coils for industrial heating and cooling processes. Bulletin 259 shows how to do your own estimating. Shows valuable improvements over former designs. Contains tables showing superiority over pipe coils and tubing. *Dean Thermo-Panel Coil Div.*



200—Heat Exchangers

Catalog HEC-1R covers carbon steel heat exchanger and condenser tubes. A typical specification, A.S.T.M. A-214, covering this grade of tubing has been broken down paragraph by paragraph to show how *Electrunite* tubing is processed to meet each requirement. Photographs show various production operations. *Republic Steel Corp.*



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HEAT EXCHANGERS and WATER HEATERS continued

201—Hot Water Heaters

Catalog 512 describes the full line of RECO hot water heating equipment. This 20-page catalog includes tables, dimensions, diagrams, and other details for both horizontal and vertical storage heaters. Special linings are indicated. RECO storage heaters are time-proved standbys for providing hot water.

Richmond Engineering Co., Inc.



202—Heat Transfer Coils

Bulletin S-55 describes new smooth-fin heat-transfer coil construction that permits closer fin spacing, greater capacity per sq ft of face area, and use of higher air velocities without turbulence or excessive friction. It also illustrates many types of extended-surface heat exchangers for heating, cooling, and processing.

Aerofin Corp.



203—Heat Recovery System

Bulletin 5700-A describes savings in heat and fuel possible with a Cochrane continuous blow-off heat recovery system. Flow diagrams show methods of installation. Contains chart determining savings in pounds/hour when the blow-down, evaporation rate, percentage blow-off, and boiler pressure are known.

Cochrane Corp.



204—Heat Exchanger Manual

This catalog contains an engineering section that provides the engineer with the means to make size estimates of heat transfer equipment. It helps the engineer to select a heat exchanger that will provide economy of service, precise operation, and long life. Contains thermal standards and reference data.

Condenser Service & Engng. Co., Inc.



HIGHWAYS, BRIDGES, and STREETS

205—Information on Asphalt

Manual Series No. 5 ("Introduction to Asphalt") includes summary information on the uses, tests, and specifications for asphalt along with a brief history of asphalt. A new and revised edition of this popular publication, almost completely rewritten to reflect the latest developments in asphalt technology.

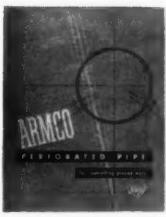
Asphalt Institute.



206—Perforated Pipe

Catalog P.P. 8358 describes Armco perforated pipe for controlling harmful ground water in highway and railroad construction and maintenance; also city streets and industrial sites. Typical methods of treating subsurface drainage problems are diagramed. Recommends installation methods. Installations shown.

Armco Drainage & Metal Products, Inc.



207—Open Metal Grid

Irving decking catalog F-300 contains illustrations, descriptions and engineering data on open metal grid bridge roadways, with many of the advantages inherent in this type of bridge roadway, such as light weight, cleanliness, drainage, safety, durability, strength, traction, and economy.

Irving Subway Grating Co., Inc.



208—Bridge Flooring

This booklet contains complete descriptions, specifications, drawings, and design data covering all types of Am-Bridge I-Beam-Lok. Included are details of flooring applications plus a brief discussion showing how Composite Tee-Beam Action can be used with I-Beam-Lok.

*American Bridge Division,
U. S. Steel Corp.*



209—Suspension Bridge Data

Catalog D-943 contains technical data making possible preliminary calculations for comparative estimates between the suspension bridge and any other contemplated type. Includes formulas for determining cable and suspender lengths, cable tensions, erection calculations, and catenary formulas.

John A. Roebling's Sons Corp.



210—Metal Lighting Standards

Kerrigan's new multi-page, indexed catalog contains engineering data on steel and aluminum lighting standards for streets, highways, and bridges. Catalog contains photographs and diagrams as well as complete specifications. Included is section on tests and charts and one listing modifications and accessories.

Kerrigan Iron Works, Inc.

HIGHWAYS, BRIDGES and STREETS continued



211—Asphalt Pocket Manual

Manual Series No. 6 ("Asphalt Pocketbook of Useful Information") is a revised and vastly expanded edition of "Asphalt Useful Tables", first published in 1946. In addition to a compilation of useful tables and miscellaneous information, the new publication contains a summary of specifications.

Asphalt Institute.



213—Reinforcing Wire Products

Catalog of American Steel & Wire products for use in highways and streets. Products included are: welded wire fabric, transverse road joint load transfer assemblies, multisafety cable highway guard, beam guard, high tensile wire and strand for prestressed concrete.

*American Steel & Wire Div.,
U. S. Steel Corp.*



212—Highway Railings

One of the most complete catalogs on this subject. Contains specifications, design data, details for 47 sizes and types of cast posts, dimensions, and properties of rails and other components. A valuable handbook for the consulting engineer engaged in the design of highway railings. Forty pages.

Michael Flynn Manufacturing Co.



214—Traffic and Safety Equipment

This illustrated brochure describes Planet's new line of highway traffic and safety equipment. Included are overhead sign trusses, roadside directional signs, bridge railings, pedestrian overpasses, and the "Planoflash", a portable night construction warning signal that is more visible than those commonly used.

Planet Corp.

INSTRUMENTS and CONTROLS



215—Portable Instruments

For those who require accuracy and portability in instruments, Bulletin 4340 is especially helpful. Contains descriptions, illustrations, and dimensional drawings of ac and dc portable instruments for laboratory use and other applications where secondary standards are required. Types and sizes listed.

Federal Pacific Electric Co.



216—Automatic Controls

Sixty-page catalog 858 illustrates a full line of mercury switch equipped controls for applications involving pressure, temperature, liquid level, mechanical movement; also hermetically sealed mercury switches and transformer relays. Available in various case styles for indoor, outdoor, or hazardous locations. Mercoid Corp.



217—Electric Controls

Engineering reference catalog 18A contains a complete line of standard Zenith electric controls and timing devices. Photos, diagrams, engineering data, and prices on automatic transfer switches, magnetic contactors, remote control switches, program clocks, automatic reset timers, cycle timers, and special controls. Zenith Electric Co.



218—Pressure Gauges

Catalog G58 introduces a comprehensive line of pressure gages for in-plant processing and general industrial applications. Available in numerous case styles and sizes including a completely safe gage case. Catalog designed for use by specifying engineers, making it easy to select the right gage at all times. Kunkle Valve Co.



219—Liquid Level Indicators

Bulletin A, "Guide to Petrometer Products," describes and illustrates the company's line of liquid level indicators and controls, dial indicators, specific gravity indicators, pneumatic single and duplex manifold valves, fuel and water gages, safety cleanout valves, blowout gun, and other Petrometer products.

Petrometer Corp.

220—Temperature Regulators

Bulletin 370-1 describes Powers Series 200 temperature regulator for pneumatic air and liquid temperature control. Any heat range. Class 3 nitrogen thermal system. Easy external adjustment. Simplified direct or reverse action changes. Automatic ambient temperature compensation. Universal mounting.

Powers Regulator Co.

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INSTRUMENTS and CONTROLS continued

221—Solenoid Valve Selection

"Engineering Information" by ASCO provides an answer to the question of "how to select a solenoid valve". Valve sizing is simplified by flow nomographs and CV factor tables. Operating principles of 2, 3, and 4 way solenoid valves, fully automatic and manual reset are covered. Types of solenoid enclosures. Automatic Switch Co.



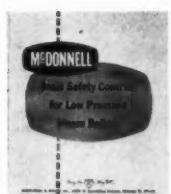
222—Water Level Recorders

Bulletin 24, tenth edition, contains eight pages of illustrations and descriptive data on the Stevens Type F water level recorder. Applications data for this extremely sensitive and accurate, yet inexpensive, recorder, is included. Also, described is the Type FM recorder and Stevens porcelain enameled iron gages. Leupold and Stevens Instruments, Inc.



223—Steam Boiler Safety Controls

Bulletin L-711 describes basic safety controls for low pressure steam boilers. Completely discusses closed heating systems and multiple boiler systems. Booklet is fully illustrated with diagrams of systems and photographs of the products. Schematic operation of McDonnell switches. Service recommendations. McDonnell & Miller, Inc.



224—Process Instruments

Catalog 2 covers indicators, transmitters, recorders, and controllers for flow, pressure, temperature, density, viscosity, and consistency. Standard instruments are stocked at warehouses in Chicago, Atlanta, Houston, Los Angeles, and Toronto, as well as at the main factory at Hatboro, Pa.

Fischer & Porter Co.



225—Specification Guide

Form 632 is a specification guide especially designed in handy folder form to assist consulting engineers to specify their choice of tank contents gaging systems for each project. Contains sample specifications for hydraulic system, and hydrostatic systems (manually operated and continuous reading).

Liquidometer Corp.



226—"Eye-Hye" Remote Gauges

Newly designed *Eye-Hye* remote gage for higher pressure is described in Sections C3.1B and C4.1D. Protruding reading medium permits observation of gage over 180° arc in front of panel. Complete description of three pressure-range model-groups, including dimension drawings. Fully illustrated with specifications.

Reliance Gauge Column Co.



227—"Oiltight" Control Units

This publication describes standard duty, heavy duty, and "oiltight" control units and stations applicable for every industry. Complete information on applications, ratings, and design features are included. All types of control units, stations, enclosures, and "oiltight" controls are shown and described.

Allen-Bradley Co.



228—Sight Flow Indicators

Unit 350 provides data on the range of sizes, materials, pressure-temperature ratings, and dimensions on Jerguson's line of sight flow indicators, which are easy to install on new or existing pipe lines. Illustrated by photographs and diagrams. Specifications on high pressure drip sight feeder also included.

Jerguson Gage & Valve Co.



229—Pneumatic Recorder-Controllers

Bulletin T-1000 gives design and operating data on the Johnson line of pneumatic recorder-controllers and indicating controllers for automatic regulation of temperature, humidity, and pressure. Typical uses in air conditioning, heating, ventilating, and industrial work are explained in this 20-page booklet.

Johnson Service Co.



230—Testing Apparatus

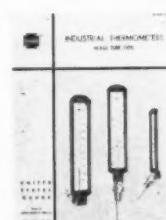
A new products bulletin describes and illustrates a series of new items manufactured by Soiltest. It includes apparatus for making the following tests: tension-compression of concrete, moisture-humidity, sand equivalent, soil consolidation, soil unconfined compression, liquid limit, and bearing capacity. Soiltest, Inc.



231—Mercury Thermometers

Catalog 101 describes full line of red-reading mercury thermometers, available in straight, side-angle, incline, recline, and multi-angle types. Also includes submarine thermometers, special application units, connections and temperature conversion table.

U. S. Gauge Division
American Machine and Metals, Inc.



232—Controls Price Lists

A new complete set of price sheets so designed that engineers, buyers, and purchasing agents will be able to price 90% of the complete line of liquid level and flow controls manufactured by Magnetrol, Inc. Includes specifications about specific gravity, pressure, and temperature ratings of the controls.

Magnetrol, Inc.



INSTRUMENTS and CONTROLS continued

233—Boiler Safety Devices

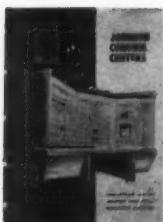
Catalog 500, "Boiler Water Columns and Gage Equipment", describes water columns, gages, valves, and other boiler safety devices available to the consulting engineer. New designs are completely described with photographs and cross sectional and mechanical drawings. Specifications, dimensions.

Reliance Gauge Column Co.

**234—Pneumatic Controls**

Bulletin S-103 describes the functions, applications, and operation of centralized pneumatic controls for air conditioning, heating, and ventilating systems. The advantages of using pneumatic transmission are explained and the latest developments in control center instrumentation are shown in this 12-page booklet.

Johnson Service Co.

**235—Corrosion Resistant Gauges**

Bulletin 3015 lists variety of ASA Grade AA corrosion-resistant gauges for vacuum service or pressures to 20,000 psi. Also describes transmitters and indicating controllers with control by-pass and remote set-point features. Includes brief notes on variety of other equipment.

*U. S. Gauge Division
American Machine and Metals, Inc.*

**236—Liquid Level Controls**

Bulletin 3004 describes the Petrometer Series 1800 liquid level controls for tanks and process vessels. Available for pressure ranges from .02 to 100 psi and to 30 in. vacuum. Gives applications and construction features. Included are pressure switch selection chart, electrical ratings, and ordering instructions.

Petrometer Corp.

**237—Automatic Control Systems**

New 8-page planning guide for engineers and architects covers the 3 important phases of designing a building's automatic control system. Describes the various types of control systems, basic components for each, selection factors to consider in design, and data on centralized remote control applications.

Barber-Colman Co.

**238—Remote Registering Systems**

Bulletin PI5, eighth edition, illustrates and describes Position Motor Type Remote Registering Systems for remote, graphic, or visual registration of water levels, gate positions, or other moving elements. A variety of self-synchronizing motor type transmitters, indicators, and recorders are described.

Leupold and Stevens Instruments, Inc.

**239—Mobile Testing Laboratories**

New sixteen-page catalog, fully illustrated, completely describes all truck and trailer models of mobile laboratories. These make possible job-site engineering testing of foundations for buildings, roads, dams, runways, and for quality control of construction materials such as concrete and asphalt.

Soiltest, Inc.

**240—Heating Boiler Safety Controls**

Bulletin P-30C describes basic safety controls for hot water space heating boilers. Six fundamental questions about safety valves are answered and each is illustrated with diagrams. One page is devoted to service recommendations showing cutaway drawings of various types of safety valves. Specifications given.

McDonnell & Miller, Inc.

**241—Bi-color Boiler Gauges**

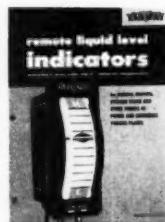
Bulletin 2044-A describes "Multi-Port" bi-color gauge MP 1050 for boilers operating at pressures up to 1050 psig. Water always shows green and steam red. Vision slot divided into series of round ports. This permits use of small glasses and small mica which are stronger and less sensitive to thermal stress.

Diamond Power Specialty Corp.

**242—Liquid Level Indicators**

Bulletin WG 1824 describes operation, installation, and advantages of Yarway fully-compensated remote liquid level indicators for accurate, easy reading of boiler water levels. Typical applications discussed, using easy-to-read diagrams. Supplementary remote signalling and controlling devices described.

Yarnall-Waring Co.

**243—Magnetic Flowmeters**

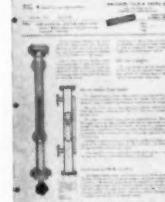
Catalog 10D1416 discusses principle and operation of magnetic flowmeters. Gives advantages and specifications of Fischer & Porter obstructionless flowmeter for measuring flow rate of difficult liquids such as concentrated acids and alkalis, slurries, sewage, pigment dyes, and many others.

Fischer & Porter Co.

**244—Magnetic Gauges**

Data Unit 327 fully describes and illustrates the new Jerguson magnetic gage which is designed for gaging liquids under conditions where glass, gaskets, and threads cannot be used due to the high potential danger of explosion or fire if the slightest trace of gas escapes. Dimensions and specifications are given.

Jerguson Gage & Valve Co.



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INSTRUMENTS and CONTROLS continued



245—Panel Instruments

Bulletin 3-15, 24 pages of descriptive information and illustrations, covers a full line of panel instruments from standard commercial use to military applications. Includes ac and dc meters, elapsed time meters, aircraft instruments and shunts, and current transformers. Dimension drawings.

Federal Pacific Electric Co.



246—Control Cabinets

Bulletin AP 5/1 deals with complete control cabinets for any type of combustion system. Illustration shows W4-FP4 designed to provide pre-purge period and semi-automatic ignition of pilot and main flame for four burners in single boiler. Picture of cabinet included. Prices furnished on request.

Webster Engineering Co.



248—Temperature Control Valves

Bulletin J-180, 4 pp, gives capacity, ranges, and dimensions for OPW-Jordan sliding gate temperature control valves. This self-contained regulator assures accurate, automatic temperature control in process systems — heating or cooling. Exclusive sliding gate guarantees tight shut-off, long life.

OPW-Jordan.



249—Dewpoint Indicators

Bulletin DPI-4 covers dewpoint indicator which determines water vapor content in gases by measuring dewpoint temperature. A primary measurement instrument, indicator gives accurate readings from ambient to -100F. Portable battery-operated unit can check moisture content of dried air or gases.

Weighing & Control Components, Inc.



247—Transmitter-Receiver Systems

Bulletin 371 describes Powers transmitter-receiver systems for remote temperature control and indication. Typical applications and data on products such as thermal and vapor-pressure type transmitters for rooms and ducts, receiver-controller with direct or reverse action and temperature indicating gauges.

Powers Regulator Co.



250—Tank Contents Gaging Systems

Suggested specifications for tank contents gaging systems — hydraulic, hydrostatic, and direct reading — are given in bulletin 463A. Model selection guides and pictorial diagrams are included, along with a list of liquids successfully gaged by Liquidometer systems, and principles of operation of each gage.

Liquidometer Corp.

INSULATION



251—Underground Pipe Insulation

News magazine, published by the manufacturer of Gilsulate insulation for underground hot pipes, carries stories and articles on actual installations. This issue describes installation at Brandeis University and gives instructions for proper curing of the Gilsulate structure. Illustrated with photographs.

American Gilsonite Co.



253—Plastic Pipe Insulation

Bulletin IN-213A describes Johns-Manville's Aerotube foamed plastic pipe insulation. This insulation stops sweating, is clean, sanitary, and extremely flexible. It comes in six-foot lengths and can be installed at substantial labor savings. Photographs show installation procedures on new jobs, and existing piping.

Johns-Manville Corp.



252—Building Insulation

Bulletin FB-105 describes Pittsburgh Corning's Foaminglas building insulation. Used for roofs, ceilings, walls, and perimeters. It is light-weight, waterproof, and long lasting. Physical properties are given as well as general specifications. Application procedures are described and illustrated. Accessories listed.

Pittsburgh Corning Corp.



254—"Ultralite" Duct Insulation

Catalog ULD describes the use of *Ultralite*, the long textile type insulation for duct wrap and duct liner. Characteristics of *Ultralite* duct liner, together with application methods, are illustrated. Facings available, shipping information, and location of local stocks are given. This 8-page catalog includes specifications.

Gustin-Bacon Manufacturing Co.

INSULATION continued

**255—Fused Silica Insulation**

Bulletin FS-1 gives background data on *Foamsil*, 99% pure fused silica insulating and refractory material, which has operating range of -450°F to 2200°F. It is acid-proof, waterproof, fireproof, dimensionally stable, unaffected by thermal shock. Physical characteristics, sizes and shapes, recommendations for use. *Pittsburgh Corning Corp.*

**257—"Snap-On" Pipe Insulation**

"G-B Snap-On Pipe Insulation," eight-page booklet, describes characteristics and application data for one piece, fiberglass pipe insulation. Application specifications cover: plumbing, heating, insulation of valves and fittings, cold piping, and dual temperature outdoor piping. Thickness charts are also included.

Gustin-Bacon Manufacturing Co.

**256—Precision Molded Insulation**

Bulletin IN-155A describes Johns-Manville *Fibrocel* precision-molded insulation for hot, cold, and chilled water lines. Made from a chemically inert silica aggregate containing in its natural state, combined water. Material never rots or molds and is not affected by atmospheric conditions. Specifications, illustrations. *Johns-Manville Corp.*

**258—Gilsulate Applications**

Illustrated booklet S-88 gives the complete story of *Gilsulate*; what it is, what it does, how it's used, and who uses it. Booklet explains installation procedures and insulating values. Also tells of the organization in back of *Gilsulate*—checking of piping layouts and soil conditions and supervision of actual installations.

American Gilsonite Co.

LIGHTING

**259—Fluorescent Lighting Fixtures**

Bulletin OD-1030 describes the *Fairview*, a new fluorescent lighting fixture with the first full 8-foot prismatic enclosure. Tells about new X-5 plastic and *Cleartex* diffuser. Includes illustrated features, photometrics, catalog and installation data. The bulletin is fully illustrated in natural color.

Day-Brite Lighting, Inc.

**262—Lighting Design Data**

Folder VE-900 is an 8-page folder which opens into two 4-page spreads for wall mounting, on desks under glass or other reference use. One side provides basic instructions and formulae on lighting calculations plus new IES footcandle levels; other side provides utilization data on 81 fixture types.

Sylvania Electric Products.

**260—Specifications Book**

Two new RLM specifications for uplight porcelain enamel and aluminum incandescent units. Important revisions in RLM specifications are covered in 1959 edition of the RLM specification book. Changes include "all-white" incandescent reflector and 8%-20% uplight fluorescent specifications.

RLM Standards Institute.

**263—Fluorescent Lamp Ballasts**

This bi-monthly newsletter covers advances in ballasts for fluorescent lighting and the activities of the Certified Ballast Manufacturers Association. It reports the latest news of industry's progress in improving fluorescent lighting performance standards. Sent free to consulting engineers on request.

Certified Ballast Manufacturers Ass'n.

**261—Lowered Ceilings**

Bulletin N-58 describes the *SC-Min-Cell* louvered ceiling. Available in two sizes, 2 x 4 and 3 x 3 ft. modules. Louvers are fabricated of aluminum, finished in baked white enamel or new *Ripple-Tex* aluminized finish. Included are suggested layouts, construction details, and illustrations of typical installations.

Neo-Ray Products, Inc.

**264—Lighting Fixtures**

The new, 12-page *Guth* condensed catalog provides a compact presentation of the complete line of *Guth* fluorescent and *Brascolite* incandescent luminaires for commercial, industrial, and institutional lighting applications. Data on surface and pendant mounted units, recessed luminaires, and *Gratelite* electric ceilings.

Edwin F. Guth Co.

To order personal copies of these bulletins fill

DIRECTORY OF ADVERTISERS' LITERATURE

LIGHTING continued

265—Floodlight Book

Catalog 320, the first completely new floodlight book by Crouse-Hinds since 1952, has colorful "new look", including colored divider sheets with individual contents tables, revamped page styling. Several new sections in the 184-page catalog include "How to Select Floodlights" and "Mercury Vapor Floodlights". *Crouse-Hinds Co.*



266—Calculation of Illumination

Especially designed by mc Philben to assist consulting engineers in calculation of illumination by lumen and point-by-point methods and lighting layouts. Folio 59-2 contains a calculation guide, new IES lighting recommendations, lamp data, room indexes, and coefficients of utilization of mc Philben units. *mc Philben Lighting, Inc.*



267—Fluorescent Lamp Ballasts

Bulletin 1204 contains complete information on fluorescent lamp ballasts. Discussed are various fluorescent circuits illustrated with diagrams. Installation and operation data included on voltage supply, interference, ventilation, and cold weather operation. Includes information on testing, and measuring current. *Advance Transformer Co.*



268—Fluorescent Industrial Lighting

Bulletin OD1022 describes Operation Up-light fluorescent industrial lighting fixtures. Case history photos and complete cost comparisons prove fixtures with 25% or more upward lighting have lower first cost and lower maintenance cost. Details and features of CFI-25 and CFI-30 fixtures are fully illustrated. *Day-Brite Lighting, Inc.*



269—Light Dimming Controls

Bulletin "The SCR Dimmer" describes Kliegl's new light dimming control employing silicon controlled rectifiers. Questions with answers give a complete word picture of this newest device. Data on this light level control includes specifications on capacities, performances, applications, size, and advantages. *Kliegl Bros.*



270—Surface, Recessed Fixtures

Neo-Ray's lighting bulletin describes many different types of surface/recessed lighting fixtures, fluorescent and incandescent, in all modular sizes. Shielding mediums range from small cell louvers to *Holophane Controlens*, glass or acrylic. Recessed units furnished with jack-clamps for mounting in ceiling systems. *Neo-Ray Products, Inc.*



out the card between pages 2 and 3 or 54 and 55

271—Electroluminescent Lamps

Discusses electroluminescent lamps now available for display of continually changing numerical or alphabetical information. It describes construction of readout lamps, indicates the capabilities and advantages of various lamp types, and summarizes principal mechanical, electrical, and visual characteristics. *Westinghouse Electric Corp.*



272—Industrial Lighting Levels

New, Illuminating Engineering Society's "Recommended Industrial Lighting Levels" are made available in pamphlet form by the RLM Standards Institute. A reference must for those concerned with planning lighting or re-lighting projects of industrial plants, utilitarian locations, and other facilities. *RLM Standards Institute.*



273—Lighting Fixtures

Bulletin describes Curtis Visitron and Regula fixtures for rapid start fluorescent lamps. Construction features are illustrated with explaining captions. Various models pictured. Illuminating performance including utilization coefficients, candle power distribution, and foot candle necessary to a given area included. *Curtis-AllBrite Lighting, Inc.*



274—Fluorescent Lamp Ballasts

"How Fluorescent Lamp Ballasts that Bear the CBM Emblem Insure Your Lighting Investment" is a 16-page illustrated booklet. The booklet explains how the Certified Ballast Manufacturers Association's ballast specifications covering lighting performance benefit all persons concerned with fluorescent lighting. *Certified Ballast Manufacturers Ass'n.*



275—Modern School Lighting

Booklet "The A-B-See of Modern School Lighting," written by a research engineer, is factual and authoritative. Various problems of classroom lighting, glare, reflection, daylight, artificial light are discussed. Types of fixtures are pictured with comparison charts and conclusions. Free to the consulting engineer. *Smoot-Holman Co.*



276—Fluorescent Lighting Fixtures

New 4-page brochure pictures and describes the unique Guth swept-wing Slimfin fluorescent luminaire with side Fin-Glow light beams. Slimfins are shown in 3 handsome finishes — white, bronze, or silvan. Folder includes complete photometric and engineering information as well as photographs of fixtures. *Edwin F. Guth Co.*



LIGHTING continued

**277—Weathertight Lighting Fixtures**

Folio 59-3 introduces new 98 Line by mc Philben as the ultimate in weather-tight fluorescent luminaires for industrial or commercial applications. 98 Line in extruded aluminum with Holophane Controlens available in 4 ft, 6 ft and 8 ft units using high output or slimline lamps. Furnishes complete specifications. *mc Philben Lighting Inc.*

**278—Shallow Recessed Troffers**

Bulletin V-700 describes Sylvania's new line of shallow recessed troffers, designed for installation in all modern ceiling systems. Features are low cost installation, wide range of models, concealed hinges and latches. Designed in three types of housings to fit all nationally known ceiling systems. *Sylvania Electric Products.*

MATERIALS HANDLING and STORAGE**279—Crawler Cranes**

Catalog 750-CG-1 describes American's newest 40 ton crawler crane with 1½ yard bucket capacity. Easily converted from shovel to backhoe to crane to dragline and various other operations. Travel assembly is described and features pictured. Various assemblies are illustrated and their features explained. *American Hoist & Derrick Co.*

**283—Building Elevators**

Catalog 534-C, a 20-page pictorial presentation in color, illustrates many important buildings equipped with Haughton Elevators. Office buildings, hospitals, hotels, apartments, industrial plants, and special-purpose structures are pictured. A complete listing of Haughton branch offices is included. *Haughton Elevator Co.*

**280—Reprints for Framing**

Suitable for office decoration are reprints of Graver's series of full-color ads on elevated water tanks. The latest ad pictures the 250,000 gal elevated tank for Hitchcock, Texas photographed against a sunset. This reprint is one of the most decorative of the series. A set of these reprints is available upon request. *Graver Tank & Manufacturing Co.*

**284—Vibrating Feeders**

Bulletin 169 describes the Eliptex extra heavy duty vibrating feeder. This feeder is built to withstand severe battering in tough service involving unusually large and heavy materials. The advantages of this feeder are listed and the principle of operation explained. Standard specifications given and installations illustrated. *Hewitt-Robins Inc.*

**281—Material Moving Equipment**

Bulletin 244 takes you to plants, yards, and shops of varying sizes showing Whiting equipment at work in different and unusual installations, many custom built. Case study write-ups deal with crane, Trambeam monorail, transportation, foundry, and chemical processing equipment. Booklet is fully illustrated. *Whiting Corp.*

**285—Tanks and Chests**

Kalamazoo vitrified glazed tile tanks and chests are described in four-page bulletin 1-55-T. Drawings and photos show how the two types of tile blocks available provide flexibility of wall design. Types, sizes, design, erection, and cost are discussed, and typical installations in industry are pictured. *Kalamazoo Tank & Silo Co.*

**282—Concrete Storage Bins**

Construction of Super-Concrete stave storage bins for industry is explained in the folder, "Bins with the Strength of Pillars." Contains tables of capacities and photographs of typical installations. Lists of prominent users, varieties of materials stored, and other uses for the bins are given in this valuable bulletin. *Neff & Fry Co.*

**286—Car Pullers**

Ten-page bulletin L-6 shows capstan type car puller for moving cars a short distance using manila rope. Three styles of drum car pullers for heavy duty car moving, shuttle work, or for servicing very large areas are also listed, as well as barge movers for shifting barges back and forth during unloading. *Clyde Iron Works, Inc.*

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DIRECTORY OF ADVERTISERS' LITERATURE

MATERIALS HANDLING and STORAGE continued



287—Continuous Weighing Processes

"Weight . . . Its Measurement and Control," 20-page catalog 12, compares batch-in, batch-out, and continuous weighing processes, and explains how a completely automatic weighing system can be assembled by building block techniques using W & C's Unitized weighing components.

Weighing & Control Components, Inc.



288—Pneumatic Conveyors

Spencer bulletin 143-B describes pneumatic conveying with stationary and portable systems. A typical diagram of each type is given; also a chart of approximate capacities and photographs showing various system components. Examples with illustrations of applications of pneumatic conveyors are shown.

Spencer Turbine Co.



289—Materials Handling, Processing

Fully illustrated brochure 182, 36 pages, presents a report of R&S diversified services for coal and iron ore mining, steel mills, and railroads. It features materials handling and processing facilities; also ore beneficiation plants other than specialized coal preparation plants and fabrication in well equipped shops.

Roberts & Schaefer Co.



290—Volumetric Feeders

Bulletin TP-11-M is a 6-page publication which describes the equipment, operation, and major features of the Wallace & Tiernan Volumetric feeder. This feeder is specifically designed to allow custom installations from standard components. Included is a chart showing typical types of installations.

Wallace & Tiernan, Inc.



291—Conveyor Systems

Bulletin G-3B describes Fuller rotary compressors and vacuum pumps; horizontal-grate material coolers; Fuller pre-heater, Humboldt suspension type; Fuller-Kinyon Airveyor, and F-H Airlslide conveying systems for handling dry, pulverized, granular, and crushed materials. Fully illustrated.

Fuller Co.



292—Hopper Discharge Valves

Bulletin describes a new valve for hopper and bin discharge. Forms an airtight seal under negative pressure, releasing material from the hopper when weight of the material forces it through the valve. Valve has no mechanical parts consisting only of a Neoprene sleeve resistant to most chemicals, high temperatures.

Dustex Corp.



293—Automatic Handling Systems

Catalog 67-A describes, illustrates (photographs and diagrams) engineered and automated handling systems. The 16-page "Plan with Planet" brochure also illustrates equipment for bulk and unit materials, automated and special handling machinery, and foundry equipment, and describes Planet's creative service.

Planet Corp.



294—"Conveyoflo" Meters

Bulletin 550-P5 describes how Builders Conveyoflo meter accurately, automatically and continuously totalizes any belt-conveyed, dry material, adapts to precision gravimetric feeding, or paces allied equipment. Bulletin graphically shows what, where, and how Conveyoflo performs. Diagrams and pictures.

B-I-F Industries, Inc.



295—Industrial Storage Systems

"Modern Industrial Storage Systems," 12-page brochure 4393, discusses the subject of storage for raw ingredients, semi-processed, or finished materials. The flexibility and adaptability of concrete silos is discussed. Descriptions of component parts and construction are supplemented with line drawings.

Marietta Concrete Corp.



296—Automatic Metering System

Bulletin FL-56 describes Hetherington & Berner's Fluidometer, an automatic batch metering system. Adoptable to practically any liquid measuring problem. Equally accurate with high or low viscosities, eliminating waste. Shown in photo and diagram are direct control, remote control, dual valve, and multi-valve systems.

Hetherington & Berner Inc.



297—Overhead Traveling Cranes

Bulletin 5000A covers Conco custom-engineered overhead electric traveling cranes, of double girder construction. Can be furnished in a wide range of capacities and spans. Also included are hand-powered overhead traveling cranes, hand-powered and electric hoists.

*Conco Engineering Works,
Division of H. D. Conkey & Co.*



298—Automatic Bulk Handling

Bulletin 531, "New Techniques for Automatic Bulk Handling," is a 12-page report covering latest methods of pneumatic conveying. It details techniques for centralized automatic control, flow control, and bulk materials distribution throughout production. Installations are pictured.

Dracco Division of Fuller Co.

CONSULTING ENGINEER

MATERIALS HANDLING and STORAGE continued



299—Wood Tanks

Eight-page bulletin 655-W explains why wood tanks can meet conditions other types of tanks cannot. It describes round, rectangular, and special tanks, as well as vats, boxes, sinks, and flumes. Lists possible uses for each along with the type of hardware and lining available, and gives installation photographs.

Kalamazoo Tank & Silo Co.



300—Cone-Roof Tanks

Graver's booklet on the many uses of standard cone-roof tanks has proved so popular that a third printing is now being completed. This 20-page booklet presents the many applications of standard steel storage tanks for petroleum, chemicals, water, and dry products. Sizes, capacities, and specifications given.

Graver Tank & Mfg. Co., Inc.



301—Elevator Systems

Catalog SW-1 describes the complete line of Haughton Elevators, with special detailed information given on Haughton "Auto-Signomatic" systems for complete automation of multiple-unit elevator groups. Includes recommended sizes and dimensions for passenger, freight, hospital elevators, and dumbwaiters.

Haughton Elevator Co.



302—Cranes and Other Equipment

Bulletin 242 describes in word and picture Whiting equipment at work in various metal-working industries. Includes hydro-arc electric furnaces, stamping trimmers, foundry equipment, cranes, rotary shears, and *Trambeam* overhead handling. Plants of all sizes using standard and special adaptions shown.

Whiting Corp.



303—Gantry Cranes

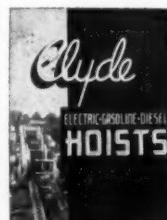
Catalog AP-20 illustrates and describes especially designed installations of American's cranes. Shown are a 325 ton powerhouse gantry crane at Noxon Rapids, Montana and a 150 ton capacity gantry crane at the Big Bend Project in California. Installations of revolver cranes. *American Hoist Pacific Co., subsidiary of American Hoist & Derrick Co.*



304—Concrete Storage Bins

Bulletin describes Super-Concrete storage bins for industry. Explains how bins are engineered specifically to purchaser's requirements. Describes the installation of concrete roofs and elevated floors, when desired. Lists materials stored and gives prominent users. Contains tables of capacities and photographs.

Neff & Fry Co.



305—Power Hoists

Bulletin 34A, 20 pages, describes the Clyde line of electric, gasoline, and diesel hoists. Gives construction details of medium capacity hoists of various line pulls. Also includes information as to selecting the hoist, information required for hoist quotation, and table of drum cable capacities. Available accessories are listed. *Clyde Iron Works, Inc.*



306—Belt Conveyor Systems

Bulletin 1000-X describes the belt conveyor systems manufactured by Hewitt-Robins. Products for conveying, crushing, stacking, blending, mixing, and reclaiming. Equipment manufactured includes conveyor belting, industrial hose, conveyor machinery, and power transmission equipment. Installations shown. *Hewitt-Robins Inc.*

MECHANICAL POWER TRANSMISSION



307—Centrifugal Pumps

Right-angle solid shaft gear drives, for centrifugal pumps and industrial use — cooling tower installations, barge service, sewage disposal, fire and flood control — manufactured in a wide range of models to meet specific requirements, are described and illustrated with engineering details in eight-page catalog 29.

Johnson Gear & Manufacturing Co., Ltd.



308—Reducing Gears

Bulletin J-14 gives complete engineering data on nine standard sizes of worm-helical units with ratios from 25.63 to 1 up to 357.5 to 1 and horsepower ratings from .85 to 175. Typical cross sections are diagrammed. Included are application data, load characteristics, service factors, selection procedure, and specifications.

Hewitt-Robins Inc.

DIRECTORY OF ADVERTISERS' LITERATURE

MECHANICAL POWER TRANSMISSION continued



309—Package Motor Reducer Drive

Fully illustrated booklet 7223, 33 pages, includes recommendations, ratings, dimensions, and other application data, to assist the consulting engineer in selecting the proper gearmotor or package motor reducer drive for his particular application. This manual describes *Moduline* gear units for maximum adaptability.

Westinghouse Electric Corp.



311—Worm Reduction Gears

Bulletin J-13 gives detailed description of six types of worm gear reducers. General specifications, styles available, application data, and service factors. Step-by-step selection procedure with various examples. Included are ratings for types and standard dimensions. This 40-page booklet is well illustrated.

Hewitt-Robins Inc.



310—Flexible Gear Couplings

Advantages and typical applications of flexible gear couplings are pictured and described in 16-page catalog C-5, "The Revolutionary New Sier-Bath Flexible Gear Couplings." Couplings are available in standard, vertical, millmotor, floating shaft, and spacer type, and in many special purpose types.

Sier-Bath Gear & Pump Co., Inc.



312—Turbine Pump Drives

Right angle turbine pump drives, in standard and combination drive installations and available in a wide range of models to meet specific requirements of high or slow speed prime movers and pumps, are described and illustrated in nine-page catalog 30. Tables show power ratings and average efficiencies.

Johnson Gear & Manufacturing Co., Ltd.

OFFICE EQUIPMENT and SERVICES



313—Plastic-Film Dust Boots

Specification sheets describe high-flex plastic-film dust boots which seal hermetically against dust, grit, or corrosives and offer minimum collapsed height for cylinder rods, traverse screws, and slides. All moderately priced and available in standard sizes from 1" to 6". Also custom shapes, sizes, and colors.

Porta-Trace, Inc.



316—Precision Computer

Bulletin S-515 describes how the Royal Precision LGP-30 computer is determining the load flow in electrical networks of up to 100 busses and 270 lines. The report describes the procedures for solution to load flow problems and illustrates typical data load sheets, load flow charts, and data printout sheets.

Royal McBee Corp.



314—Electronic Digital Computer

Brochure S-526R1 describes the Royal Precision LGP-30, a desk-sized, stored-program, general purpose electronic digital computer. Specifications and features are listed and illustrated. New optional photo-electric punched tape reader and high-speed punch unit illustrated. Components described and pictured.

Royal McBee Corp.



317—Surveying Instruments

Bulletin 2462 describes Path surveying instruments distributed by Charles Bruning Co., Inc. These are economically priced, precision instruments. Each instrument in line is illustrated with complete description. Included is a complete price list of line with each instrument illustrated and described.

Charles Bruning Co., Inc.



315—"Copyflex" Reproduction Machine

Bulletin A-2232B describes the Bruning Copyflex Model 300 reproduction machine. This compact table-top model diazo (white-printing) machine for copying large and small drawings, specifications, business forms, has a full 30 inch printing width. One knob control makes it easy to operate. Specifications.

Charles Bruning Co., Inc.



318—Portable Tracing Units

Brochure describes line of thin, lightweight portable tracing units which speed tracing of maps, and illustrations. Also used to trace artwork on Bristol board and to opaque and strip-in negatives. May be hung on wall to display transparencies. Fluorescent illumination, shatter-proof top.

Porta-Trace, Inc.

PIPING, VALVES, and PLUMBING



319—Knitted Metal Mesh

Folder SM-2-58 describes mesh knitted from metals. Defines its unusual properties and outlines briefly how and where it can be used to advantage. This material is efficient as an air filter and liquid entrainment medium. Many other uses explained.

*Metal Textile Corp.
Division of General Cable Corp.*



325—Pipe Fittings

Catalog I presents the complete line of NIBCO wrot, cast solder, cast drainage, flanged, and flared tube fittings. It is a manual of technical information to help the consultant select fittings for copper tube installations. Included are rough-in measurements, advantages of using NIBCO fittings, engineering data, NIBCO Inc.



320—Flexible Gaskets

Technical brochure describes and illustrates the use of Hamilton Kent's "Tylox C-R" flexible gaskets for coupling recessed pipe of all sizes. Gaskets are of a special cross-sectional design to prevent distortion as pipe is coupled. Diagrams show how gasket works. Photographs show method of installation.

Hamilton Kent Manufacturing Co.



326—Altitude Control Valves

Altitude control valves are described in a new 16-page bulletin W-4-B. Standard single and double acting altitude valves are shown, along with differential, stop check, combination, electric, stop starter, and other special altitude valves. Complete parts lists, dimensions, and instructions given.

Golden-Angerson Valve Specialty Co.



321—Hard Rubber Pipe, Fittings

New, complete, twelve-page, two-color bulletin PF-1300 describes hard rubber pipe, fittings, and valves; dimensions, chemical and physical properties of heat-resistant Buna-N compound and natural rubber, as well as general information. Cross-section dimensional drawings of all types of valves are shown.

Luzerne Rubber Co.



327—Liquid Strainers

Bulletin 6 deals with liquid strainers, single and duplex, for pressures from gravity to 900 psi. Capacities from 6 to 7500 gpm of water or 50 viscosity oil at 6 psi pressure drop. Mesh size 8 to 200, depending on liquid and contaminant. Strainer basket catches all contaminant; none is left in shell or piping.

William W. Nugent & Co., Inc.



322—Gate Valves

Ludlow & Rensselaer bulletin A describes in detail double disc gate valves. Cut-away photographs show various parts and construction. Line drawings show the different types of valves with dimensions charted for each valve. Directions for ordering new valves and repair parts are given. Valves A.W.W.A. approved.

Ludlow Valve Manufacturing Co., Inc.



328—Bronze Gate Valves

Bulletin V-126 describes Fairbanks patented 200 lb bronze gate valves in which the nickel alloy seat rings can be replaced in from 7 to 10 minutes without the need of ever removing the valve body from the line. Replacement illustrated step by step. Cutaway photographs show construction.

Fairbanks Co.



323—Fabricated Pipe Fittings

Bulletin 525 illustrates standard and special fabricated fittings which help in planning piping and equipment layouts. Data includes specifications and prints on standard fittings for lightweight pipe. The bulletin also illustrates special fabrications designed to save time and labor.

Naylor Pipe Co.



329—Wrought Iron Pipe

Comprehensive 64-page booklet discusses 4-D wrought iron pipe for downspouts, soil, waste, and vent lines. Includes sections on corrosive conditions, comparative service, Durham systems, cost considerations, and specifying data. Photographs of vent corrosion accompany two building piping surveys.

A. M. Byers Co.



324—Lubricated Plug Valves

How ACF lubricated plug valves can save money and add efficiency to hot and chilled water air conditioning systems is described in Bulletin AP 1059. These valves are ideal for use as balancing cocks, condenser return, boiler and chiller feed, gas, water, or oil supply valves. Illustrated.

W-K-M, Division of ACF Industries, Inc.



330—Motorized Valve Operator

Bulletin 21-58 describes the new Type P-2 LimiTorque motorized valve operator for small globe and gate valves. A compact, economical, and dependable operator for use on valve, either new or already in service. Photographs and diagrams show operation and construction.

LimiTorque Corp., Division of Philadelphia Gear Corp.

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DIRECTORY OF ADVERTISERS' LITERATURE

PIPING, VALVES, and PLUMBING continued



331—Water Coolers

This new 20-page, two-color booklet 892 describes the complete Ebro line of water coolers. Emphasis is placed on this company's new cooler which furnishes both hot and cold water permitting the making of beverages. Features of the cooler are described in words and pictures. Booklet also describes accessories. *Ebro Manufacturing Co.*



332—Strainers

Strong's complete line of chemical, air, steam, gas, oil, and water line strainers is described in bulletin SS-21C. Ductile iron, cast or semi-steel, bronze or new all-stainless types are presented along with sizes, pressure and temperature capacities, specifications, and prices. Models illustrated photographically.

Strong, Carlisle & Hammond.



333—Electric Wall Fountain

Bulletin T-474 describes new "Wall-Temp" Model WT-13, completely self-contained, refrigerated, electric wall fountain, which mounts flush to wall and off the floor at any desired height. Fully concealed plumbing. Complete engineer's specifications and capacity ratings. Capacity 13 gph.

Temprite Products Corp.



334—Ball-Type Flexible Struts

Catalog 229A describes Barco's ball type flexible struts for refineries, power plants, chemical plants, paper mills, steel plants, and steam and processing piping. Cutaway photographs show construction and diagrams show dimensions. Included are engineering applications, advantages, capacities, and general specifications. *Barco Manufacturing Co.*



335—Gate Valves

Bulletin 198 describes and illustrates newly designed 125-pound and 150-pound bronze, screwed end, union bonnet gate valves, inside screw rising stem and non-rising stem. Features of construction are enumerated and emphasized, and complete dimensions of available sizes (1/4" to 3") are listed.

Wm. Powell Co.



336—Coal Tar Protection

Hot coal tar protection in easy-to-apply tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly to soften the pitch, then spirally wrapped onto pipe surface. Tapecoat provides long-life plied coal-tar pipeline coating. *Tapecoat Co.*



337—Steel Valves

Catalog 14 describes the complete Edward line of cast and forged steel valves for power, petroleum, chemical, marine, and industrial applications. Data includes ASA dimensions, ASA pressure-temperature ratings, and ASTM basic materials specifications.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Co.



338—Pneumatic Valve Operator

Bulletin E-470 describes Fisher 470 pneumatic operator; a small, compact piston actuator designed to handle the most difficult control problems. It presents comprehensive information on construction features, principle of operation, adjustments, related types, performance, dimensional and specification data. *Fisher Governor Co.*



339—Iron Gate Valves

OIC's new Ductile iron gate line from 1/2" thru 2" is featured in Bulletin 1010. Valve has new spread flange design and is first valve to take advantage of unique properties of Ductile iron. Extra length body bonnet bolts store bolting energy and prevents leakage. Shell-molded pressure parts and stainless steel trim. *Ohio Injector Co.*



340—Electric Water Coolers

Illustrated information sheet WC-13 explains and illustrates new Haws Model HWT-13, electric water cooler that hangs on the wall, leaving floor area 100% clear. Space saving cooler has all plumbing and electric connections concealed; complements modern decor. Sheet gives complete specifications and capacities. *Haws Drinking Faucet Co.*



341—River Crossing Pipe

Booklet L-115 describes American Moxol ball joint pipe for river crossings and other difficult installations. Map shows various locations of installations. Gives description, suggestions for use, method of assembling. Many pictures are used showing actual installing of pipe. Complete specifications on all diameters. *American Cast Iron Pipe Co.*



342—Boiler Service Valves

Bulletin E125, 22 pages, "Everlasting Boiler Service Valves," contains quick and slow opening straightway valves—Model W, angle valves, "Y" valves, duplex blow-off units, water column valves—Model W, and fire protection valves—opening and closing types. Includes a full page of material specifications. *Everlasting Valve Co.*

PIPING, VALVES, and PLUMBING continued



343—Butterfly Valves

Bulletin 583 contains information for easy selection of the valve needed for required pressure drop in the size and construction for air, gas, or liquid lines. Valves are pictured and diagrams show construction. Allowable pressure drop for Rockwell's seven classes of valves are charted. Control methods described.

W. S. Rockwell Co.



349—Plastic Pipe, Fittings, Valves

Bulletin of engineering information on PVC plastic pipe, fittings, and valves. Specification, design, and installation information is included as well as a comprehensive corrosion resistance comparison chart for seven types of plastic pipe carrying 162 chemicals. Charts show fluid and gas flow characteristics.

Kraloy Plastic Pipe Co., Inc.



344—Glass Lined Sewer Pipe

Folder deals with the glass-lined sewer pipe with a mechanical joint. Amvit Glas-Glaz pipe is available in 4-ft lengths. It is root and infiltration proof and is glass lined inside and out. The pipe has been designed for an under-the-house drain and also as a house-to-street sewer.

American Vitrified Products Co.



350—Plug Valves

Twelve-page catalog 581 GP contains specifications of all sizes (1 to 4 in.) and pressures (1000 psi to 10,000 psi CWP) of Graham nonlubricated plug valves. Cutaway view shows construction details of this round port, full opening valve. Photos of all valves; parts lists; body and trim materials also included.

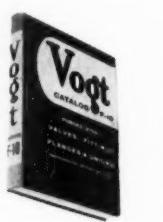
Texsteam Corp.



345—Valves

Bulletin B-453 describes special features and advantages of high-pressure, high-temperature Yarway Welbond valves for a wide range of service in modern steam power plants and related installations. Rating table and selection chart show how to select proper valve for specific requirements. Illustrated.

Yarnall-Waring Co.



351—Steel Valves and Fittings

Henry Vogt Machine Company has just released its new catalog of forged steel valves, fittings, flanges, and unions. Its 432 thumb indexed pages feature new types and trims to meet severe fluid and gas handling duties at all temperatures and pressures. A permanent book containing complete information.

Henry Vogt Machine Co.



346—Snow Melting Systems

"Steel Pipe Snow Melting and Ice Removal Systems," 32 pages, presents the case for snow melting systems and shows typical installations in commercial and industrial locations. Design data is complete with information on anti-freeze mixtures, sizes, and spacing.

*Committee on Steel Pipe Research,
American Iron and Steel Institute.*



352—Gate and Check Valves

Catalog 57 describes Darling's line of gate valves and check valves in iron, bronze, steel, and special alloys for all types of valve application. Also included are fire hydrants and accessories for fire protection. This 244 page bound volume gives specifications; pictures facilities; and illustrates product applications.

Darling Valve & Manufacturing Co.



347—Air, Liquid Reels

Bulletin AIR-259, a 6 page bulletin, listing 21 different types of air-liquid reels. Bulletin offers complete technical data and dimensions. All models fully illustrated, explanation of applications, hose sizes, lengths, and maximum pounds for working pressures are listed. For use with liquids, gases, and air.

Appleton Electric Co.



353—Insulated Piping Systems

The new edition of the Ric-wil product catalog covers construction features for prefabricated, insulated piping systems for steam, hot water, oil, or refrigeration distribution lines. Types of systems covered include Hel-cor, Uniline, type J, and cast iron. Prefabricated accessories are also included.

Ric-wil, Inc.



348—Safety and Relief Valves

Catalog 53 describes safety and relief valves in brass, bronze, iron, steel, stainless steel, and aluminum; for air, gas, steam, and liquid relief; $\frac{1}{4}$ through 8 in. to 15,000 psig. Includes suggested applications, relieving capacity data, and illustrations of typical units. Navy approved type valves featured.

Kunkle Valve Co.



354—Butterfly Valves

Bulletin 650-R2 describes complete line (10" to 96") of Builders Model BV rubber-seated butterfly valves. Bulletin illustrates design features, dimensional data, types of operators available, and includes handy sizing nomograph for selecting butterfly valves. Tight-closing, compact, and easy to operate.

B-F Industries, Inc.

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PIPING, VALVES and PLUMBING continued



355—Valve Selection

New bulletin 115 covers some basic points to consider when selecting valves for process piping systems and emphasizes the many advantages and savings that can be made by the proper selection of valves to meet piping characteristics. Some typical process applications are also covered. Cut-away drawing shows valve operation. Hills-McCanna Co.



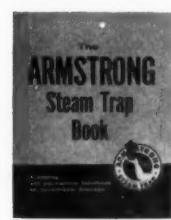
356—Jacketed Pipe and Fittings

Bulletin J-57 describes pipe, welded steel fittings, spring loaded plug valves, and valves all jacketed, manufactured by Hetherington & Berner Inc. Different types of valves and fittings are illustrated together with cutaway photographs showing construction and operation. Also jacketed pumps and flexible hose. Hetherington & Berner Inc.



357—Stainless Steel Fittings

This 22-page catalog explains how Speedline stainless steel fittings reduce piping costs by allowing the designer to take advantage of the new and more economical schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates industrial applications. Speedline Stainless Steel Fittings Div., Horace T. Potts Co.



358—Steam Traps

Catalog K, the Armstrong steam trap book, has been revised and expanded to 48 pages. New material includes complete data on Armstrong open float and thermostatic steam traps; strainers in ½ to 6-inch sizes in semi-steel; new pipe size tables; and additional data on trap selection. Armstrong Machine Works.



359—Control Valves

Bulletin J-170, 8 pp, gives specifications, capacity, and dimensions of OPW-Jordan sliding gate diaphragm control valves. Valves can be used with a controller for temperature or pressure regulation, or as a self-contained pressure regulator. Exclusive sliding gate gives tight shut-off, accuracy, minimum maintenance. OPW-Jordan.



360—Plastic Pipe

Bulletin describes Southwestern lightweight plastic pipe. This pipe is easy to handle, store, and transport. It is simple to install; resists chemicals; is unaffected by electrolytic corrosion; reduces installation and maintenance costs. Available in all sizes with ready-to-use fittings. NSF approved for drinking water. Southwestern Plastic Pipe Co.



361—Clay Pipe

Bulletin PS-101 describes Kaul Clay Company's Presto SEAL vitrified clay pipe. Socket and spigot ends are factory-molded polyester, with a rubber gasket permanently imbedded in the socket end. When socket and spigot ends of pipe are joined, a perfect, permanent, flexible seal is made in seconds. Kaul Clay Co.



362—Magnetic, Motorized Valves

Within its 24 pages, catalog V-58 illustrates and lists specifications of magnetic and motorized valves for use with air, water, gas, steam, oil, and refrigerants. Also included are solenoid coil rating tables—one for liquids, the other for compressible fluids. Dimensional drawings are included. Mercoid Corp.



363—Pipe, Fittings and Valves

Bulletin 139 describes Barnstead's complete line of tin-lined pipes, fittings, and valves. Combining the chemical protection of pure tin with the strength and durability of threaded pipe, this tin-lined equipment protects the purity of distilled water from the point of origin to the point of ultimate use. Barnstead Still & Sterilizer Co.



364—Cast Iron Pipe

Catalog of cast iron pipe, fittings, fire hydrants, water works gate valves. Specifications, dimensions, and weights of ball and spigot, mechanical joint, flanged pipe, and fittings covered. Mathews Modernized, Mathews Flanged Barrel, and R. D. Wood Swivel Joint fire hydrants described. Also Wood gate valves. R. D. Wood Co.



365—PVC Pipe

Revised edition contains new corrosion ratings, expanded information on thermal compensation, vacuum service, abrasion resistance. Installation and application sections have been enlarged. Diagrams illustrate joining of PVC to other piping materials. Includes dimensional data and working pressures for Schedule A tubing. A. M. Byers Co.



366—Drinking Water Coolers

Bulletin T-472 describes complete line of self-contained drinking water coolers. Capacities from 3 to 27 gph; air-cooled or water-cooled condensing units. Includes new wall mounted type, explosion proof, stainless steel, hot and cold, and wall remote models. Complete specifications, capacities, and other data. Temprite Products Corp.

PIPING, VALVES and PLUMBING continued

367—Metallic Mesh

Brochure ME-9 contains engineering information on the retention of liquid entrainment, including design data, principles, and suggestions. Some of the many uses for mist eliminators are discussed and information is provided on materials, sizes and shapes, grids, and density.

*Metal Textile Corp.
Division of General Cable Corp.*



373—Flexible Ball Joints

Bulletin 31A contains layout diagrams, photographs, and data on how to solve problems of thermal expansion and contraction in piping economically with flexible ball joints. Applicable to piping runs of any length and of any diameter from $\frac{1}{4}$ inch to 12 inches, including high temperatures steel piping.

Barco Manufacturing Co.



368—Jointing Flexible Gaskets

Technical brochure describes and illustrates the use of "Tylox C" and "C-P" sewer pipe jointing flexible gaskets. Gaskets are for single or double offset pipe of all sizes. Diagrams show gaskets properly positioned and under full compression. Photographs show installation procedures. Coupling methods diagrammed.

Hamilton Kent Manufacturing Co.



369—"Hot'n Cold" Water Coolers

Booklet entitled "How to cut coffee-break time in half" is offered by Ebcos. This booklet describes the new Hot'n Cold water cooler with a beverage locker. Complete line of Hot'n Cold coolers are illustrated. Also shown in pictures are the various applications. Shown in chart form are possible yearly savings.

Ebcos Manufacturing Co.



370—Valves

Dimensions and detail drawings plus a parts list are included in 20-page bulletin E-165. Bulletin discusses class 125 single and double disc, class 250, cylinder-operated valves, lubricated valves, valves for emergency protection, steam-jacketed valves, and valves for boiler blow-off. Fully illustrated.

Everlasting Valve Co.



371—Vitrified Clay Pipe

Jointed vitrified clay pipe known as Amvit, with a built-in mechanical joint made from polyvinyl chloride, is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out.

American Vitrified Products Co.



372—Iron Gate Valves

New OIC Ductile iron gate valve (2" thru 12") designated Pipe-Mate is described. Folder contains complete material specifications; describes valve's design specifically for Ductile iron material. Pipe-Mate meets dimensional requirements of API Spec 600. Pressure parts are Ductile Iron, trim is stainless steel.

Ohio Injector Co.



374—Gate Valves

Catalog 1200 describes W-K-M's new pressure sealing gate valves with unique double-action floating seats for positive seals both up and downstream. Through-conduit, stainless stem, slab-type gate, anti-friction bearings, and many other features are described. 2" thru 12", ASA 150 lb and 300 lb.

W-K-M, Division of ACF Industries, Inc.



375—PVC Pipe and Fittings

Bulletin PF 1200, eight pages, presents a list of applications for PVC pipe and fittings where corrosion resistance, non-toxicity, and noncontamination are required. Mechanical, electrical, thermal, and miscellaneous properties of both normal impact and high impact PVC products are in table form.

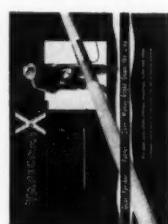
Luzerne Rubber Co.



376—Protective Coating

Tapecoat X is a coal tar protective coating in tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly with a torch, then wrapped onto pipe surface with one-half inch overlap. Provides protection on underground pipe equivalent to hot-applied coal tar.

Tapecoat Co.



377—Valves

Bulletin V-6 is a condensed catalog of the more popular Fairbanks valves used in heating, piping, and air conditioning systems. Includes bronze and iron body gate, globe, and check valves with pressure ratings from 125 lb to 300 lb. Each valve illustrated and sizes available and basic descriptions provided.

Fairbanks Co.



378—Motorized Valve Operator

Bulletin 20-58 describes the LimiTorque motorized valve operator for actuation of plug valves. A simple, easily installed unit that can be built either to NEMA IV or NEMA VII standards. The linear operator is supplied with all necessary adapting parts. Fully illustrated.

LimiTorque Corp., Division of Philadelphia Gear Corp.

To order personal copies of these bulletins fill

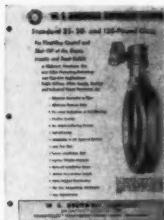
DIRECTORY OF ADVERTISERS' LITERATURE

PIPING, VALVES and PLUMBING continued

379—Butterfly Valves

Bulletin 582 describes Rockwell butterfly valves, standard 25, 50, and 125 lb class, for throttling, control, and shut-off of air, gases, liquids, and semi-solids in processing, utility, and industrial applications. Features of this valve are described and pictured. Accessories are listed. Dimensions and specifications.

W. S. Rockwell Co.



380—Fluoridation Unit

Illustrated specification sheet graphically explains new fluoridation unit for individual or multiple drinking water outlets. Haws FL Series attach easily to water supplies, providing correctly fluoridated water where general water supplies are untreated. Includes detail drawings, explains functioning.

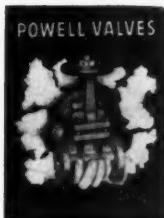
Haws Drinking Faucet Co.



381—Corrosion-Resistant Valves

Bulletin 201 acquaints potential users with the completeness of the Powell corrosion-resistant valve line. It is profusely illustrated, lists the large variety of metals and alloys in which valves are available. Includes pressure-temperature ratings, dimensions, features of construction, and general specifications.

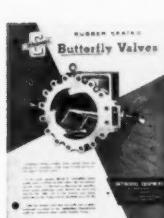
Wm. Powell Co.



382—Butterfly Valves

Bulletin 90 describes Fisher-Continental rubber seated butterfly valves, designed for controlling a wide range of fluids while providing positive non-leak closure. It presents comprehensive information on construction features, operation, flow characteristics, pressure drops, specifications, and dimensions.

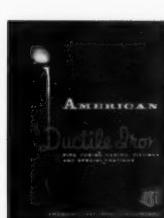
Fisher Governor Co.



383—Iron Pipe, Tubing, Fittings

Catalog L-127 describes the complete line of American ductile iron pipe, tubing, casings, fittings, and special castings. Includes valuable technical information; grades, specifications, dimensions, and weights. Typical applications include underground piping, industrial piping, well casing, and many others.

American Cast Iron Pipe Co.



384—"Impactogear"

Catalog 14-C describes the new "Impactogear," a ring gear and pinion assembly permitting a man with a portable power wrench to operate large cast steel globe valves without assistance. Can be fitted to any 10-, 12-, or 16-inch valve of 900 psi or higher pressure.

Edward Valves, Inc., subsidiary of Rockwell Manufacturing Co.



385—Steel Fittings

Catalog H-1 provides information about the complete "Husky" line of low-pressure 150 lb carbon steel fittings: straight tees, 90° elbows, 45° elbows, and reducers. Practical advantages of "Husky" fittings are included. Also shown are Schedule 40 and Schedule 80 high pressure specification tees. Specifications. NIBCO Inc.



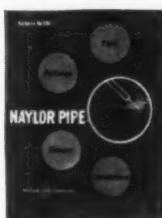
386—Steam Specialties

Bulletin SS-140-C contains detailed data on Strong's extensive line of in-line steam traps, strainers, and pressure reducing valves. Applications, detailed specifications, list prices, and cutaway drawings are included, along with the wide range of fitting sizes, materials, and temperature and pressure capacities. Strong, Carlisle & Hammond



387—Lightweight Pipe

New 8-page condensed catalog summarizes complete line of Naylor lightweight pipe, fittings, flanges, and connections. Lists typical applications. Includes standard specifications on pipe from 4 to 30 inches diameter, together with details on standard fittings and flanges. Covers couplings for pipelines. Naylor Pipe Co.



388—Relief Valves

New 8-page bulletin W-2A describes Golden-Anderson cushioned surge relief valves in sizes $\frac{1}{2}$ to 36 in. These valves are used to protect water lines against excessive pressures caused by surges in the system. Installation arrangements, parts lists, dimensions, and specifications included.

Golden-Anderson Valve Specialty Co.



389—Filters

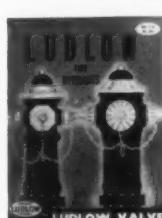
Bulletin 7C, 16 pages, illustrates and describes the full line of crenulated laminated disc liquid filters for removing small micron-size foreign solids from most liquids in one pass through at a rate of 1 gpm at 1 psi pressure drop to 1260 gpm at 3 psi pressure drop, of 35 ssu viscosity fluid.

William W. Nugent & Co., Inc.



390—Fire Hydrants

Bulletin 56H describes different types of fire hydrants, all complying with American Water Works Association's latest specifications. Engineering features, material specifications, construction details, various assemblies in exploded views, and installation dimensions are shown. Also included are directions for ordering. Ludlow Valve Manufacturing Co., Inc.



POWER EQUIPMENT and FUELS



391—Steam Generators

Bulletin SB61 covers open-pass and multi-pass 2-drum steam generators for pressurized and balanced draft operation. Each type of 2-drum steam generator is illustrated giving concise descriptions of components; boilers, steam scrubbers, superheaters, economizers, air heaters, stokers, and burners.

Erie City Iron Works.



397—Heat Recovery Silencers

A 12-page bulletin gives full information on Maxim heat recovery silencers, used to produce steam or hot water for heating or processing operations. Engineering data includes descriptions, capacities, installation, blueprints, cutaways, dimensions. Typical installations are described, complete with layouts.

Emhart Mfg. Co., Maxim Division.



392—Package Unit Burners

Bulletin describes compact forced draft package unit burner. This single, coordinated, factory-tested assembly, ready for attachment to boiler, combines all necessary equipment for burning oil or gas fuels. Gives details of design and features. Diagrams are keyed to chart giving dimensions for all models.

S. T. Johnson Co.



398—Packaged Firetube Boilers

Bulletin GB-1 gives testimonial proof of the value-packed Amesteam generator, packaged firetube boiler. Sizes available: 10 through 600 horsepower; 15 through 250 pounds design pressure. Lists well-known users with photographs of actual installations. Illustrated literature available upon request.

Ames Iron Works.



393—Gas and Gasoline Engines

Bulletin SA-542-E describes the V-122 and the V-125 twelve-cylinder gas or gasoline engines manufactured by the Climax Division of Waukesha Motor Co. These engines develop a maximum of 520 and 610 horsepower respectively. Engines combine simple rugged construction with smooth running.

Climax Engine Manufacturing Co.



399—Integral-Furnace Boiler

Bulletin G-94 describes B&W's newest integral-furnace boiler, Type PFI. This new pressurized-furnace, oil or gas fired steam generator is designed for power, process, or heating loads requiring steam capacities up to 400,000 pounds per hour at pressures to 1150 psi and steam temperatures to 900 F.

Babcock & Wilcox Co.



394—Underfeed Stokers

Catalog No. 401, fully illustrated, gives complete data on double retort underfeed stoker. This stoker is built for heavy duty service in the intermediate size range for boilers of about 20,000 pounds to 34,000 pounds of steam per hour capacity. Burns nut, pea and slack or crushed run of mine bituminous coals.

Detroit Stoker Co.



400—Spiral-Wound Gaskets

General catalog, 28 pages, tells about the development of the original spiral-wound gasket and its present applications in aviation, atomic research, process industries, power plants, and ships of the Navy and Merchant Marine. It also lists various metals and fillers used in the manufacture of these gaskets.

Flexitallic Gasket Co.



395—Recirculation Generators

Basic advantages of the Type LFW forced recirculation generators for high temperature water are given in ten-page bulletin 700. Chart compares capital investment, operating costs, and maintenance and repairs for high temperature water and high pressure steam for district heating from central plant.

International Boiler Works Co.



401—Burners

Form 5808 describes light oil, gas, and dual-fuel oil-gas burner designed for operation against firebox pressure. Fires number 2 fuel oil and/or natural or LP gas. Special burner head produces high combustion efficiency and prevents flame pulsation. Models available for firing pressurized or natural draft boilers.

Iron Fireman Manufacturing Co.



396—Burners

Twenty-page catalog describes Petro commercial-industrial oil, gas, and dual fuel burners used for heating, power, and process steam requirements. Includes section on "How to Select a Burner." Illustrates several typical installations and various burners, from 8 through 200 gal per hr oil capacity.

Petro.



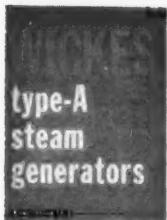
402—Mobile Generating Plants

Trailer mounted mobile generating plants, complete rolling power stations, are described in this plastic-bound handbook. For temporary tie-in, or semipermanent installation, diesel or dual fuel operation, these mobile plants may be practical. In four sizes: 350, 500, 1000, and 1250 kw. *White Diesel Engine Division, White Motor Co.*

To order personal copies of these bulletins fill

DIRECTORY OF ADVERTISERS' LITERATURE

POWER EQUIPMENT and FUELS continued



403—Steam Generators

Wickes type-A steam generators, compact, efficient, shop assembled water tube boilers, are illustrated and described in catalog 56-1. It gives typical superheater arrangements for the boilers with section, plan, and side views of drainable "S", pendant, and drainable superheaters. Specifications are given.

Wickes Boiler Co.



404—Induced Draft Fans

Catalog SF10 describes the complete line of Whirllex induced draft fans including construction details. Included is information on independent pedestals, sole plates, self-supporting stacks, and special ductwork. Component parts are illustrated and cutaway photo shows operation of fan.

Fly Ash Arrestor Corp.



409—Deaerators

Literature on various types of deaerators is offered in five sections, starting with the "Why and How" of deaeration (4650). The others deal with Jet Tray Deaerators (4651); Tray Type Deaerators (4652); Cold Water Deaerators (4653); and Surface Type Deaerating Hot Water Heaters (4654).

Cochrane Corp.



410—Rotary Oil Burners

The new Todd Series B rotary fuel oil burners are summarized in four-page bulletin TD56-82X. It includes a burner size selector chart and lists 11 advanced design features of seven basic sizes rated from 400,000 to 22,500,000 Btu per hr, with oil capacity from 3 gal per hr to 150 gal per hr.

Todd Shipyards Corp., Products Div.



405—Vibra-Grate Stokers

A water cooled vibrating grate stoker (sizes from 25,000 to 150,000 pounds of steam per hour) that does not require a dust collector and assures freedom from smoke, even at low ratings. Burns low grade coals with top efficiency and is easily adapted for burning gas or oil in combination with coal, or singly.

American Engineering Co.



411—Air Preheaters

The important points to consider in selecting a preheater for use with small boilers (25,000 to 250,000 lbs per hr) are discussed in four-page bulletin on the new package Ljungstrom air preheater. Explains how preheater saves fuel, increases boiler output and reliability, and permits use of lower grade fuels.

Air Preheater Corp.



406—Package Boilers

Catalog VP-3, 16 pages, describes the new Type VP package boiler. Following a section of background information is an outline of principal design features. These boilers are shop assembled and provide steam capacities from 4000 to 90,000 lb per hr. Space requirements and specifications are in table form.

Combustion Engineering, Inc.



412—Shot Cleaning System

Bulletin 2145 covers the new Diamond shot cleaning system for the most efficient and economical cleaning of such external horizontal tube surfaces as superheaters, reheat, economizers, and air heaters. Gives advantages, principles, construction, and operation. Chart shows draft loss from ineffective cleaning.

Diamond Power Specialty Corp.



407—Burners

This new 16-page booklet illustrates and describes Ray Burner equipment for firing oil, gas, or combination oil or gas: manual, semiautomatic, and fully automatic models; rotary, pressure atomizing, inshot gas, packaged forced draft boiler-burner units. A burner for every domestic, commercial, or industrial need.

Ray Burner Co.



413—Boiler Feed Systems

Catalog 55-C contains new specification and application data on standard and special design boiler feed systems from Schaub Engineering Company. Pumps furnished with Dura-Hard Electropolized impellers for "double" service life. High pressure boiler feed systems include rugged power plant pump line.

Fred H. Schaub Engineering Co.



408—Package Steam Generators

New six-page bulletin entitled "More Performance From Less Investment" describes in detail Cyclotherm's line of 18 sizes of package steam generators 15 hp to 650 hp. Also specifications, on 10 sizes of new package hot water generators, 670 mbh to 6700 mbh.

Cyclotherm Division

National-U.S. Radiator Corp.



414—Deaerating Heaters

Bulletin WC-106A describes new and larger tray deaerating heaters. Dependable and efficient for utilities, institutions, and industrial power plants. Each is specifically tailored to fit the power cycle, heat balance, and operating conditions of the individual plant. Included are cutaway drawings and installations.

Graver Water Conditioning Co.

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POWER EQUIPMENT and FUELS continued

**415—Wormfeed Stokers**

Bulletin 559 describes Canton's *Duraflex* wormfeed stokers for bituminous and anthracite coal. Included are specifications and ratings for bituminous coal, descriptive drawing showing assembly and method of feeding, components of the feeding assembly, model boiler room plan, and the many features of the stoker. *Canton Stoker Corp.*

**416—Sewage Plant Power Engines**

Bulletin 1099-B3A describes Worthington power engines for sewage plants. Complete line, spark-ignition, dual fuel, tri-power engines from 440 to 5000 hp, can meet your exact requirements. Includes heat balance estimating data, and individual engine ratings. Design advantages illustrated. Installations pictured. *Worthington Corp.*

**417—Steam Generators**

Bulletin PSG-3, 10 pages, presents design and construction details, tables of capacities, dimensions, and weights of package unit type steam generators. Available in three standard pressures of 175, 250, and 375 psig, the boilers are designed to be used with different types of firing and control equipment. *Henry Vogt Machine Co.*

**418—Transfer Oil Heater**

Bulletin 25A-1 describes the 100% automatic, no freezing, no corrosion operation of the Texsteam 25A transfer oil heater which provides temperatures to 600°F with low pressure vessels and flow circuits. Unit is gas or oil fired. Bulletin includes specifications and curve for sizing to specific applications. *Texsteam Corp.*

**419—Hydraulic Turbines**

Consultants in hydraulic power will find 48-page brochure 02B7301 a valuable reference book. Turbines, reversible pump-turbines, and important accessories are discussed. Over 50 well-known public and private power and industrial installations are featured. Data on 97 installations is tabulated for quick reference. *Allis-Chalmers.*

**420—Glass Lined Smokestacks**

Bulletin SS-202A describes *Permaglas* smokestacks, protected against corrosive flue gases. Features include longer life, low maintenance, lightweight, and easy installation. Chart shows how *Permaglas* stacks cost less over a period of years. Special *Permaglas* sections, smokestack accessories, and typical installations. *A. O. Smith Corp.*

**421—Viscous Fluid Heaters**

Bulletin 1.4K 1 describes heaters for viscous fluids. Type O is a standard straight tube preheater for fuel oils and similar fluids and Type TS is a standard tank suction heater for heavy fuel oils and other fluids of similar viscosity. Includes features, dimensions, diagrams, capacities, and fuel oil requirements. *American-Standard, Industrial Division.*

**422—Packaged Boilers**

Twelve-page catalog describes Type AS Superior packaged boilers for capacities from 4000 to 13,000 lbs steam per hr. Complete packages with rotary burners, integrated controls, soot blowers, refractory, and insulation, these units also have quiet rear mounted draft fan which provides air-cooling of furnace floor. *Superior Combustion Industries, Inc.*

**423—Water Separator Snubbers**

Bulletin 271 describes water separator snubbers which extract 100% of the liquid water from water-sealed vacuum pump exhausts and reduce discharge noise. Models are illustrated with photographs and diagrams show construction. Dimensions, weight, and rated capacity. *Burgess-Manning Co.*

Industrial Silencer Div.

**424—Induced Draft Fans**

Bulletin L-3 covers the complete line of centrifugal induced draft fans. Included are rating tables shown at 600 F, dimension data, construction material specifications, recommended sizes of fans for oil, gas, or coal fired boilers. Typical installations are also shown. *Lehigh Fan & Blower Division,*

Fuller Co.

**425—Exhaust Gas Boilers**

Bulletin HR-2 describes exhaust gas boilers and heat exchangers together with performance tables. Jacket water cooling data for standard and supercharged engine performance is given. A wide variety of applications are described covering the use of recovered heat for steam generation and heating of water and air. *Sims Co.*

**426—Engine-Driven Generators**

Large engine-driven synchronous generators for all standard ratings and voltages, and speeds from 450 to 1800 rpm, are the subject of booklet 05B6139. Construction features and modifications are thoroughly discussed. Ratings are listed. Booklet also deals with belted and direct-connected exciters. *Allis-Chalmers.*

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DIRECTORY OF ADVERTISERS' LITERATURE

POWER EQUIPMENT and FUELS continued



427—Underfeed Stokers

Guide Specifications brochure GS-2 including three drawings provides design criteria on ram-type underfeed stoker fired steam plants for steam loads of 10,000 to 40,000 lb per hr. Covers boilers, stokers, ash handling, and other equipment. Glossary in back of book defines terms used.

Bituminous Coal Institute.



428—Burners

Factory engineered and built integral air register for control of combustion air is feature of Petro WR burner. Register controls entire air supply for maximum combustion efficiency. Models available for firing all fuel oils, including number 6, and for dual fuel oil-gas firing. For Scotch or firebox boilers.

Petro.



429—Packaged Boilers

A completely new line of low and high pressure forced draft water tube packaged boilers is described in bulletin 1400. Known as the *Compak* series, these factory-tested units are offered in 22 sizes ranging in capacity from 12 through 750 horsepower. Engineering specifications with catalog literature.

International Boiler Works Co.



430—Engines

Bulletin SA-612-B, a complete listing of all Climax engines and complete power unit ratings showing maximum hp available for bare engines and recommended operating ratings for various applications of power units with accessories. Complete bulletins describing all models shown in the Power Chart are available.

Climax Engine Manufacturing Co.



431—Packaged Boilers

Webco-Ray automatic 3-pass packaged boilers for heating, power, and process steam are featured in the 1958 Webco catalog. Ratings, data, dimensions, installation details, and other specification data are given in this 8-page booklet. Capacities of these packaged units range from 25 to 600 boiler hp.

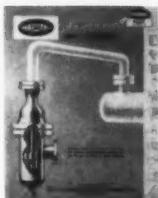
Western Boiler Co.



432—Rotary Burners

Bulletin describes Johnson Model 53 fully automatic, metering pump rotary burners. This burner insures smooth automatic starts even after lengthy shut downs. Will fire on oil only, gas only or combination oil and gas. Available in 9 sizes from 28 hp to 560 hp. Detailed dimensions given.

S. T. Johnson Co.



433—Cleaning Natural Gas

Data sheet 3-ATC-1, published by Aerotec Industries, Inc., deals with a description and applications of the Aerotec dry method of cleaning natural gas. Bulletin includes a cutaway section of the gas scrubber showing the vortex tube used as a basis for scrubbing gas without use of fluids.

Aerotec Industries, Inc.



434—Atomizing Fuel Oil Burners

The Todd Vee-Cee type variable capacity mechanical atomizing fuel oil burner for installations with widely fluctuating loads is fully described in four-page bulletin TD56-16X. Bulletin shows special construction that gives uniform, easily oxidized spray, constant pressure and quick cold starting.

Todd Shipyards Corp., Products 1.



435—Package Boilers

Bulletin G-76-F describes the B&W integral-furnace package boiler, Type FM. This space saving, oil and/or gas fired steam generator is designed for process or heating loads requiring steam capacities up to 50,000 pounds per hour at pressures up to 750 psi and steam temperatures to 700 F.

Babcock & Wilcox Co.



436—Pipe Flange Gaskets

Condensed general catalog describes and illustrates pipe flange gaskets, including compression-gage type, self-centering type, and gaskets for recessed fittings. Also shows gaskets for boiler manhole cover assemblies, and boiler handhole and tubecap cover assemblies. Illustrated with photographs.

Flexitallic Gasket Co.



437—Automatic Coal Firing Units

A compact, automatic coal firing unit for installations of 175 hp to 350,000 pounds of steam per hour and upward. Engineered for top efficiency with both low and high ash coals. Exclusive conveyor feeder won't clog and provides even distribution throughout entire range, 50 to 7500 lbs coal per hr.

American Engineering Co.



438—Steam Generators

Catalog SB60 condenses Erie City's line of boilers, superheaters, economizers, air heaters, stokers, oil and gas burners. Included are installation views of field erected, packaged types and waste heat boilers as well as section views of firing equipment and fire tube boilers. Designed for easy reference.

Erie City Iron Works.

POWER EQUIPMENT and FUELS continued

439—Spreader Stokers

New bulletin 860 illustrates and describes the Detroit *RotoStoker*, a spreader stoker with overthrow rotor feeders. For use with medium size boilers up to about 60,000 pounds of steam per hour capacity. Power dumping, hand dumping, or stationary grates. May be installed in almost any type boiler.

Detroit Stoker Co.

**440—Package Boiler**

Bulletin MR-1A announces the new compact Model "R" *Amesteam* generator, a complete package boiler available in sizes ranging from 10 hp through 600 hp. Oil or gas fired. Each unit is completely equipped with all necessary boiler fittings, is guaranteed to operate at 80 percent thermal efficiency.

Ames Iron Works.

**441—Oil and Gas-Oil Burners**

A variety of oil and combination gas-oil burners are included in illustrated 24-page bulletin 5629. It describes rotary oil burners, firing units with integral air registers, complete package units with factory control panels. The oil volumeter that provides steady, uniform oil flow with any oil is shown.

Iron Fireman Manufacturing Co.

**442—"Maxim" Silencers**

"Guide to Maxim Silencers", a 4-page bulletin, is a handy guide to the complete line of Maxim Silencers. To help you select the right silencer for your purpose, it gives a capsule description of each type, lists model numbers and size ranges, and refers to available bulletins that give complete descriptions.

Emhart Mfg. Co., Maxim Division.

**443—Boiler Auxiliary Package Units**

Bulletin 59-1 describes auxiliary package units available for boilers of 10,000 to 100,000 lbs steam per hour, steam pressure to 300 psig. Units have various combinations of deaerating feedwater heaters, boiler feed pumps, condensate surge tanks to reduce maintenance and to increase plant efficiency.

Wicks Boiler Co.

**444—Engines**

Complete 80-page catalog includes power curves, sectional drawings, and subassembly photographs of six basic engines in 19 models, a power range of 100 to 2150 bhp. Diesel, gas, and dual fuel engines and generator sets are available as a custom installation.

*White Diesel Engine Division,
White Motor Co.*



PROCESS EQUIPMENT

445—Multi-Zone "Platecoil"

Bulletin 159, 48 pages, completely describes new Multi-Zone Platecoil, covering styles, dimensions, specifications, and operational data. Methods of calculating heat transfer equipment requirements are outlined. Typical installations are pictured and described. Available on request.

Tranter Manufacturing Inc.

**447—Magnetic Separators**

Catalog 945 covers all aspects of magnetic separation and wet concentration problems. Single drum, concurrent magnetic cobbers, counterflow magnetic separator, and triple drum separation are discussed. Diagrams show operation of various types of separators. Products and installations illustrated.

Jeffrey Manufacturing Co.

**446—Rubber Products**

Catalog describes products and equipment of the Goodyear Rubber Company, not to be confused by any other company of similar name. This booklet primarily shows company facilities as products are made to customer requirements. Mechanical rubber products, hose, rolls, molded and extruded rubber products.

Goodyear Rubber Co.

**448—Process Equipment**

An integrated line of equipment for the process industries is described in 28-page catalog 25C6177. Equipment includes compressors, pumps, crushers, mills, screens, kilns, washers, material handling equipment, motors, control, heaters, metal detectors, turbine generators, condensers, and water conditioners.

Allis-Chalmers.



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DIRECTORY OF ADVERTISERS' LITERATURE

PROCESS EQUIPMENT continued



449—Products and Production

Catalog "This is RECO" describes RECO products, production, and design service in detail. Photographs, listing of practical dimensions, materials, special linings, specifications are shown for pressure vessels, storage tanks, process heat exchangers, pipe, duct, towers, columns, and autoclaves.

Richmond Engineering Co., Inc.



455—Corrosion-Proof Plastic

Maintenance-free Duracor resists practically any acid, fume, or gas. Strong, lightweight units requiring minimum support also offer integral resistance to heat or flame. Hoods, ducts, elbows, and other parts can be either supplied from stock or fabricated to individual customer specifications.

Ceilcote Co., Inc.



450—Butyl Rubber

Twelve-page, two-color bulletin describes in detail Butyl rubber. Many applications of this rubber that stays "alive" are pictured. Many comparison graphs show effect of heat aging, electrical stability, shock absorption, sound damping, tear resistance, abrasion loss, gas permeability, and low temperature flexibility.

Enjay Co., Inc.



456—Monitor Packaged Boiler

Bulletin AD 166 describes the new monitor packaged boiler which is designed to supply high pressure steam for food processing plants, laundries, chemical plants, dairies. Rated 15 to 60 hp, 150 psi. Burns oil, gas with equally high efficiency (minimum 80%). Pre-engineered, pretested in factory.

Cleaver-Brooks Co.



451—Classifiers

Bulletin 39-C, a 24-page catalog on construction and application of the Hardinge counter-current classifier, overdrain classifier, heavy-media separator, hydro-classifier, and hydro-separator. Includes flow sheets of combined grinding and wet classifying applications, also sand washing arrangements.

Hardinge Co., Inc.



457—Air Operated Baum Jigs

Bulletin 965 describes air operated jigs capable of 700 tph capacity, handling up to 8 in. lump coal. Four-page bulletin lists cleaning, power, water consumption features as well as central control system. Outlines jig pulsating mechanism and ejector drive with photographs. Cross-section photographs show operation.

Jeffrey Manufacturing Co.



452—Jet Apparatus

Bulletin J-1 describes SK's line of jet apparatus for lifting, heating, and mixing liquids, moving and mixing air and gases, and handling semi-solids and slurries. Jet vacuum apparatus is included. Data helps reader select proper apparatus and lists descriptive catalogs containing full details on each type.

Schutte and Koerting Co.



458—Dielectric Heaters

Booklet 15B6431 describes the operating advantages of dielectric heaters for a variety of functions such as drying, baking, heating, and curing of non-conducting materials. Various sizes and styles are described. A listing of all units gives electrical requirements, Btu output, and physical sizes and weights.

Allis-Chalmers.



453—Materials Handling, Processing

Fully illustrated brochure 182, 36 pages, presents a report of R&S diversified services for coal and iron ore mining, steel mills, and railroads. It features materials handling and processing facilities; also ore beneficiation plants other than specialized coal preparation plants and fabrication in well equipped shops.

Roberts & Schaefer Co.



459—Self-Centering Rubber Rolls

Booklet describes "Loring-Aligner" self-centering, rubber-covered rolls. Rolls permit high speeds in the handling of strip and web materials. Cutaway view shows typical construction including slotted rubber roll covering. Drawings illustrate various types of automatic self-centering rolls.

Goodyear Rubber Co.



454—Air Preheaters

Brochure entitled "The Ljungstrom Air Pre-Heater for Process Equipment" describes the fuel economy possible with this regenerator. Table of comparative fuel and power costs and graph clearly show these economies. Explains how added furnace capacity gives increased production and higher quality.

Air Preheater Corp.



460—"Platecoil"

This bulletin, 59-PI, describes and illustrates the new Platecoil configuration. It contains pertinent information on construction, application, and advantages in heat transfer. Specifications, size, weight, and surface area of standard units are listed. Varied applications are pictured and discussed.

Tranter Manufacturing Inc.

PUMPS and COMPRESSORS



461—Process Pumps

Bulletin 724.1 describes a new line of process pumps by Goulds Pumps, Inc. Pumps are built in accordance with API610 specifications and in eleven sizes providing capacities to 850 gpm and heads up to 350 ft. This coverage will meet the requirements of refinery and allied industries applications.

Goulds Pumps, Inc.



467—Rotary Positive Blowers

Series 400 and 600 rotary positive blowers, gas pumps, and vacuum pumps are described in bulletin S65C, including dimension drawings and cutaways. Volumes up to 20,000 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Features anti-friction bearings and wide-face herringbone timing gears.

Sutorbilt Corp.



462—Heavy Duty Compressors

Bulletin A-62 describes the WN-112 V-Vertical heavy duty compressor. Its 24 pages include photographs of various installations, front and side view cross section drawings, diagrams of controls and lubrication systems, specification and dimension charts, accessories data as well as other pertinent information.

Joy Manufacturing Co.



468—Vertical Industrial Pumps

Bulletin B-505 describes complete range of vertical industrial service pumps. Capacities up to 40,000 gpm. Alternate types of drives available. Recommended for cooling towers, tank, line pumping, process and chemical pumping also for drainage, dewatering, and recirculation.

*Peerless Pump Division
Food Machinery & Chemical Corp.*



463—Centrifugal Pumps

Bulletin 1100 describes Weinman Types LB and LLB single stage, double suction, split case centrifugal pumps for circulating and booster service. Pumps have 140 to 340 gpm ratings, at 20 to 150 ft heads. Bulletin gives sectional view with keyed parts list, specifications, and performance curves.

Weinman Pump Manufacturing Co.



469—High Pressure Pumps

Bulletin 295 on *Triplex* high pressure plunger describes American-Marsh models capable of pressures to 5,000 psi. Used for pressure testing and backwashing valves, pipes, vessels, and hydraulic equipment. Capacities 1.1 to 35 gpm. Bulletin shows drawings of cross-sections of construction.

American-Marsh Pumps, Inc.



464—Industrial Pumps

Catalog describes uses and construction of new *FloWay* line of industrial pumps manufactured by Fiese & Firstenberger. Capacity range is from 15 to 4000 gpm. *FloWay* vertical turbine pumps are designed for every industrial and municipal pumping need and for every pumping condition.

Fiese & Firstenberger Mfg., Inc.



470—Centrifugal Pumps

Bulletin 1004 describes the De Laval single stage, double suction, Type L, M, and P centrifugal pumps with capacities from 1000 to 20,000 gpm. Chart lists product features with construction data and advantages. Cutaway photograph with captioned arrows shows construction and operation. Specifications.

De Laval Steam Turbine Co.



465—Metering Pumps

Catalog 900 describes the new line of Masterline metering and proportioning pumps. Available in four models with capacities to 1030 gph. New crank design features improved accuracy, parts interchangeability, operational efficiency, and ease of maintenance. Also featured is the new streamlined safety shield.

Hills-McCana Co.



471—Submersible Pumps

Bulletin B1200 describes industrial size submersible pumps for plant, commercial buildings, irrigation, large scale water supply and booster systems. Cutaway photographs show construction and features. Many advantages of the Sumo pump are outlined. Available in 3550 rpm and 1750 rpm, 3 to 125 hp.

Sumo Pumps Inc.



466—Rotary Pumps

Catalog 59-S includes illustrations and specifications on general purpose and heavy-duty Viking rotary pumps. Also includes data on many special rotary pump units. A complete list of district offices and distributors reveals where additional information can be obtained promptly. All models are illustrated.

Viking Pump Co.



472—Turbine Power Plant Pumps

Easy-to-use Engineer's Guide gives condensed description, specifications, selection, and dimensional data on Roth turbine power plant pumps and packaged boiler feed and condensate return units. Full information on Roth certified hot water performance and 10 year shaft guarantee. Cover is pictorial index.

Roy E. Roth Co.

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DIRECTORY OF ADVERTISERS' LITERATURE

PUMPS AND COMPRESSORS continued

473—Manual of Pumping Problems

"How to Solve Pumping Problems," 36-page instruction manual, covers important fundamentals of estimating requirements of the average pumping job. It contains sample problems on hydraulic systems, general transfer, and pressure transfer, plus tables, charts, and other pertinent engineering data.

Roper Hydraulics, Inc.



474—Rotary Pumps

Eight-page bulletin G-2 gives construction, dimensions, capacities, and applications of Gearex rotary pumps: internal bearing type for lubricating materials; external bearing type for non-lubricating. Capacities are 1 to 550 gpm; pressures 250 psi for viscous liquids, 50 psi for water; viscosities 32 to 500,000 ssu.

Sier-Bath Gear & Pump Co., Inc.



475—Centrifugal Pumps

Catalog 4-PP-11 Rev. describes the features of Gorman-Rupp petroleum pumps. Straight-in-suction, no check valve, and an enclosed impeller featured in the "O" Series design. Temperature, altitude, viscosity, performance, and specification tables are available with the complete engineering data in bulletin.

Gorman-Rupp Co.



476—Grout Pumps

Bulletin WS-150 contains data and specifications on grout pumps, the only Simplex type for grout, slush, mud, and other heavy viscosity liquids. Pumps feature simplified heavy-duty design and can use air, steam, gasoline, diesel, electric motor or turbine drives.

Wagener Pump Div.,
Canton Stoker Corp.



477—Chemical Solution Pumps

Bulletin 2-340 describes Bruner's chemical solution pump. Model 17 complete package includes power drive, electric cord, plastic tubing, foot valve, automatic injection nozzle control, and instruction manual. Diagrams show operation for different uses. Features of pump are listed with various accessories.

Bruner Corp.



478—Displacement Type Pumps

Bulletin XA-458, 6 pages of condensed but complete data, describes positive displacement type pumps for handling all common gases at volumes from 3 to 880 cfm and pressures to 6 psig. Tables of performance and dimension data assist in selection from among 18 standard units with gear diameters of 7" or smaller.

Roots-Connersville Blower Div.



479—Fluid Handling

Bulletin RP-1101 is the reprint of an article which appeared in Power and Fluids. It describes the latest advances in power plants, and how they affect the fluid handling equipment. This comprehensive article covers pumps, ejectors, condensers, and deaerators. Illustrated with photographs, charts, and graphs.

Worthington Corp.



480—Air Compressors

Bulletin GO-259 on new line of air compressors constructed with carbon-graphite piston rings and skirts. Air is completely oil free because there is no oil in the air compressor. Models are available portable, tank-mounted and as tankless models. Capacities are $\frac{1}{4}$ hp to $\frac{1}{2}$ hp. Pressure's to 190 lbs. Specifications.

Bell & Gossett Co.



481—Boiler Feed Pumps

Bulletin 65 describes new heavy duty turbine-type boiler feed pumps (to 150 gpm), which give longer life with less maintenance. Pumps have specially hardened impellers; oversize, heavy duty bearings, shafting, and leak-proof, wet-or-dry shaft seals. Specifications and details are given in handy bulletin.

Fred H. Schaub Engineering Co.



482—Heavy Duty Process Pumps

Bulletin 727.1 gives detailed description of new line of vertical heavy-duty process pumps for both wet pit and dry pit installations. Capacities to 720 gpm; heads to 190 ft. For pit depths to 20 ft. Regularly supplied in 316 stainless steel combinations. Other materials to suit users' requirements.

Goulds Pumps, Inc.



483—Aftercoolers

Bulletin 712 is a 10-page technical book on aftercoolers particularly for the consultant. Cutaway drawings in three colors help show the operation. Benefits to be obtained from dry compressed air are given along with chart showing moisture left in given volume of air at pressure. Selection charts and installations.

R. P. Adams Co., Inc.



484—Centrifugal Pumps

Bulletin 1002 describes single stage, single and double suction centrifugal pumps. Cutaway photographs show types G and I single suction pumps with capacity range from 50 gpm to 600 gpm and types C, I, and K double suction pumps with capacity range from 175 gpm to 600 gpm. Capacities and dimensions.

De Laval Steam Turbine Co.



PUMPS AND COMPRESSORS continued

**485—Positive Displacement Blowers**

Covering 18 standard sizes of positive displacement blowers, for air pressures to 10 psig and vacuum service to 12" hg, new Bulletin AF-258 provides selection and dimension information and typical installation views. Units have gear diameters of 7" or smaller, and capacity from 6 to 920 cfm on pressure service. Roots-Connersville Blower Div.

**486—Heavy Duty Rotary Pumps**

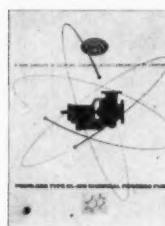
Catalog "C" describes the complete Viking's heavy-duty rotary pump line. Eleven sizes are offered in capacities from 10 to 1050 gpm in 165 different models. Pumps are suitable for pressures to 200 psi on lubricating liquids, to 100 psi on non-lubricating liquids, and for handling thin gaseous liquids. Viking Pump Co.

**487—Stationary Air Compressors**

Bulletin A-73 effectively exhibits the many features of the semi-radially designed WN-224, largest package-type heavy duty stationary air compressor available. Installation photographs, a fully keved section drawing, and an easy-to-read specifications chart are also contained in the new 12-page publication. Joy Manufacturing Co.

**488—Vertical Turbine Pumps**

Bulletin 11 describes Watermaster vertical turbine pumps. These pumps have the same precision engineering and high qualities that characterize high capacity pumps by Fiese & Firstenberger. They cover a wide range of uses where the need is for relatively small capacities, from 15 gpm to 125 gpm. Fiese & Firstenberger Mfg., Inc.

**489—Process Pumps**

Bulletin B-1608 illustrates both DL (grease lubricated) and DM (oil lubricated) process pumps for chemical service and refining service. Both pumps have capacities to 1000 gpm, heads to 430 feet, DL has 250°F range, while DM has 450°F limit.

*Peerless Pump Division
Food Machinery & Chemical Corp.*

**490—Pumps and Blowers**

California series rotary positive blowers, gas pumps, and vacuum pumps are described in bulletin S-59G with dimension drawings and capacity tables. For volumes up to 2480 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Features anti-friction bearings, wide-face timing gears, oil-free. Sutorbilt Corp.

**491—Turbine Pumps**

In bulletin 450, Edition No. 3, data and specifications are given for 17 sizes of American-Marsh turbine pumps. Tables show choice of construction materials to suit various applications. Both disassembled and sectional views illustrate simplicity of design and construction. General dimensions and specifications. American-Marsh Pumps, Inc.

**492—Suction Split Case Pumps**

Bulletin 1200 describes Weinman double suction split case pumps for heavy duty pumping. Three types, L-1, L-2, L-3 for low, medium or high head service. Bulletin gives complete information including dimensions for 15 models available, lists features, and shows photographs of typical installations. Weinman Pump Manufacturing Co.

REFRIGERATION and LIQUID CHILLERS

**493—Cold Plates and Snow Pans**

Bulletin 663 gives data and specifications on Dean cold plates and snow pans for food service display and preservation. Promotes food sales by keeping food absolutely sanitary at all times. No cracked ice. Easily cleaned. Shows how to do your own estimating. Beautifully printed in four colors.

Dean Products, Inc.

**494—Liquid Chillers**

Catalog AC-225 describes complete line of factory packaged liquid chiller units with open type compressors from 10 to 125 hp. Gives engineering details on unit components as well as complete capacity data in tabular form on each unit. Cutaway photographs show construction and operation. Required specifications. Chrysler Corp., Airtemp Division.

To order personal copies of these bulletins fill

DIRECTORY OF ADVERTISERS' LITERATURE

REFRIGERATION and LIQUID CHILLERS continued

495—Liquid Chillers

Catalog AC-233 describes complete line of factory packaged liquid chiller units with hermetic type compressors from 3 through 30 hp. Gives engineering details as well as complete capacity data in tabular form on each unit. Cutaway photographs show construction and operation. Schematic wiring diagrams.

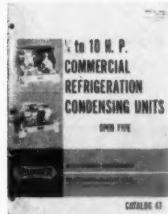
Chrysler Corp., Airtemp Division.



496—Refrigeration Condensing Units

Catalog 47 describes Brunner open-type commercial refrigeration condensing units. Complete specifications on models from $\frac{1}{4}$ to 10 hp units are included in the new brochure. The wide horsepower range meets every job requirement. Separate engineering data sections for use by installing engineer. Models illustrated.

Brunner Div., Dunham-Bush, Inc.



497—Refrigeration Equipment

Bulletin 105 describes means of making refrigeration completely and reliably automatic in food chilling, freezing or in frozen food warehousing, holding a specified sub-zero temperature evenly at all room heights, handling any moisture load without shut-down or defrosting maintenance. Photographs and diagrams.

Niagara Blower Co.



498—Packaged Liquid Chillers

Bulletin R4C covers a new line of packaged liquid chillers with multiple cylinder hermetic compressors. Chillers are available in sizes 10 tons thru 100 tons. All units are shipped completely assembled and are factory engineered and tested before shipment to insure proper performance. Tables of capacities.

Curtis Manufacturing Co.

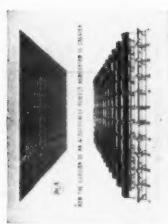


SOUND, SIGNAL, and ALARM SYSTEMS

499—Auditorium Acoustics

Brochure 3R 3528, "How the Illusion of a Perfect Auditorium is Created," describes the auditorium at David Sarnoff Research Center, Princeton, New Jersey. High fidelity loudspeakers, recessed microphones, and a progressive delay system create the illusion of sound coming from stage regardless of seating location.

Radio Corporation of America.



500—Economy School System

Eight-page catalog illustrates a flexible, economical school system, combining sound, intercom, and time tone signals. This system can be easily expanded to provide console or rack panel equipment, interior fire, and emergency alarms without sacrificing original wiring, conduit, or classroom stations.

Executone Inc.



501—Clock and Program Systems

Bulletin CL-572 describes the centrally controlled clock and program systems for schools, institutions, public buildings, and industry. Included is description of various systems with illustrated wiring diagrams. Features and applications of various types of clocks and audible signals are discussed. Specifications given.

Edwards Co., Inc.



502—Manual Telephone Systems

Bulletin 133A illustrates a variety of manual telephone systems from two station telephone systems to 200 line switchboard systems. Quick reference for choice of system to fill the varying communication needs in the school, office, factory, home, hospital, and hotel. Specifications given.

S. H. Couch Co., Inc.



503—Fire Alarm Systems

Catalog illustrates and describes Standard's March Time, Master Code, and Box Code systems. Also covered are supplemental pre-signal circuits; non-code continuous sounding bells and horns; code transmitters; control panels; stations; detectors; signals and accessories. Specifications included.

Standard Electric Time Co.



504—Doctors' Register System

Bulletin 22 describes the new *Dial-In Doctors' In-and-Out Register System* for large hospitals. The system permits inexpensive placement of registers at all doctors' entrances, eliminates space and wiring problems, reduces installation expense, and facilitates future expansion. For existing hospitals or new.

Auth Electric Co., Inc.



SOUND, SIGNAL and ALARM SYSTEMS continued

505—Clocks and Signals

New engineers' and architects' catalog contains general descriptions, illustrations, specifications, and complete details on time and program systems (electronic, synchronous wired, Autaset impulse); clocks (secondary, synchronous, wall, double-faced, tower, special designs); signal equipment.

Stromberg Time Corp.

511—Fire Alarm Systems

Bulletin 76-4809 provides complete information on Honeywell's new line of coded and auxiliariized fire alarm systems, offering choice of coded signals in a large bell-capacity, completely supervised system. Information on Honeywell's unique four-way service for such systems and a sample specification included.

Minneapolis-Honeywell Regulator Co.

**506—School Sound Systems**

Four-page brochure 7316-E-58 illustrates and describes a new and complete line of school sound distribution systems. It covers equipment suitable for the smallest to the largest school units. Building block flexibility of console styles, panels, and functions explained. Specification sheets furnished on request.

DuKane Corp.

512—"Acoustic-Booths"

Bulletin describes Acousti-Booths which make telephoning easy even in the noisiest places. Outlines principle, design, construction, and performance. Each model is illustrated and general specifications are given. Widely used in factories and other industrial locations.

*Burgess-Manning Co.
Industrial Silencer Div.*

**507—Communication Systems**

Catalog S-104R illustrates and describes 17 models, single channel to three channel communications systems. Both table top turrets and consols with capacities from 22 to 180 rooms. Provisions included for telephone intercom, loudspeaker intercom, high fidelity FM-AM radio tuner, 3-speed transcription player.

Stromberg-Carlson, Special Products Div.

**513—Hospital Communication**

Twelve-page color booklet illustrates and describes a large variety of individual hospital communication and sound systems, including audio-visual nurse call, doctors' paging, bedside radio-sound, and administrative intercom. Equipment, operating features, local planning, and service facilities available are discussed.

Executone Inc.

514—Signal Systems

A pocket size resume of all Edwards products for industrial and commercial applications. It fully describes the advantages and convenience of modern signaling, covering the full range from large control, communications and protection systems to single components. Various products pictured.

Edwards Co., Inc.

**508—Clock Catalog**

Covers clock and program systems — two types include synchronous motor-powered secondary clocks, the other combining secondary clocks, minute-impulse type. Both have simplified programming, automatic resetting of secondary clocks. Bell control boards, various type signals, and clocks included.

Standard Electric Time Co.

515—Sound Systems

Bulletin 3R-3490 discusses and defines sound systems. Monaural or Mono-phonetic? Binaural or Stereophonic? A well-known expert in the field, Dr. Harry F. Olson, of RCA, clarifies the confusion in terminology regarding the basic types of sound reproducing systems by defining and describing characteristics.

Radio Corporation of America.

**509—Fire Alarm Systems**

Bulletin 131A explains, "What is a Couch local fire alarm system?" It tells how to select, from a complete line of systems, the modular fire alarm system for your institutional, commercial, or industrial building. Each of your system layouts include wiring diagrams, specifications, and a variety of optional features.

S. H. Couch Co., Inc.

516—Time Recording Systems

"First Quality for Timing Accuracy" contains general description of electronic, synchronous wired, and Autaset impulse time and program systems with illustrations of the master time control, secondary clocks, and signals. Also illustrated and described briefly are attendance time recorders, job cost recorders.

Stromberg Time Corp.



DIRECTORY OF ADVERTISERS' LITERATURE

SOUND, SIGNAL and ALARM SYSTEMS continued



517—"Dial-X" Telephone Systems

Folder S-100R-2 shows how to banish seven common telephone annoyances with a *Dial-X* private telephone communication system. Switchboard equipment and four styles of telephones are illustrated and described for ten to seventy-four line systems. *Dial-X* system is unmatched for flexibility.

Stromberg-Carlson, Special Products Div.



518—Communications Equipment

A new convenient wall chart of electronic and communications equipment symbols is offered consulting engineers. This time-saving guide is based on IRE, NEMA, and MIL standards and covers sound distribution, paging, private telephone, intercom, nurses' call, and MCS equipment symbols (17 x 22 in.).

DuKane Corp.

STRUCTURAL MATERIALS and EQUIPMENT



519—Sidewall Panels

Bulletin describes Tectum sidewall panels, the answer to industrial sound control problems. Can be used with steel, aluminum, cement-asbestos, and other types of outer covering. Advantages listed in picture and caption; standard sidewall and cavity wall construction diagrammed. Specifications, installation photographs. *Tectum Corp.*



523—Horizontal Shoring

New 3-color bulletin shows Beatty-Pecco horizontal shoring used on variety of jobs. Shows cost saving advantages, sizes available, and gives permissible spans for slabs from 44 to 187 lbs/sq ft. Explains how simple wedge lock works and gives advantages over conventional false-work used in erection of structures. *Beatty Scaffold, Inc.*



520—Ridge Frame Steel Buildings

New 20-page booklet describes Stran-Steel Corporation's complete line of rigid frame buildings with the luxury look of Stran-Satin for industrial and commercial use. Building features, construction details, and dimensions are clearly shown. For manufacturing and processing plants, warehousing, and retail operations. *Stran-Steel Corp.*



524—"Pozzolith" Concrete

Bulletin P-36B discusses *Pozzolith*, the admixture for concrete. Points out how the use of this ingredient increases strength, bond strength, workability, durability; reduces shrinkage, permeability. It is recognized as an air-entraining agent, makes concrete resistant to scaling, and provides retarding action. *Master Builders Co.*



521—Long Span M-Decks

Installation data and detail drawings are given in 16-page catalog LSD-58 for use of long span M-decks. They have been especially designed to provide a better balanced, more efficient structural unit for roof and combined roof-ceiling construction. Includes acoustical treatment and lighting. *R. C. Mahon Co.*



525—Rolling Counter Shutters

Bulletin 103 describes the Kinnear rolling counter shutters with midget slats. These metal shutters afford protection against weather, pilfering, or illegal entry. End photographs show construction of slats. Diagrams show dimensions for both crank and push-up operation. Includes specifications and special features. *Kinnear Manufacturing Co.*



522—Aluminum Windows

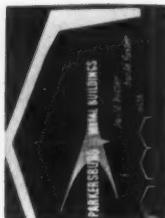
Catalog A-59 describes the complete line of Bayley aluminum windows, including original Bayley features. The booklet includes such items as projected windows, pivoted windows, class room windows, ribbon windows, and detention windows. Dimensions, construction, design, fasteners, materials, and finish. *William Bayley Co.*



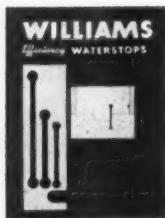
526—Steel and Aluminum Grating

This 16-page catalog shows the three basic types of grating construction; gives more than 30 dimensional drawings of subtypes; eight safe load tables covering steel and aluminum grating, roadway grating, and sidewalk slabs; tables on panel widths, tread widths, and floor armor. Planning layouts are given. *Borden Metal Products Co.*

STRUCTURAL MATERIALS and EQUIPMENT continued

**527—Metal Buildings**

Catalog BD-659, contains pictures, details, and story of the newest addition to the famous Parkersburg quality line of metal buildings. *Clear-Span* from 40' to 120'. Any length. The company looking for real economy and plus quality in one building, should investigate. You build better and faster with SF Series. *Parkersburg Rig & Reel Co.*

**528—Waterstops**

Four-page bulletin WS-59 covering complete line of rubber, vinyl, and neoprene waterstops with molded accessories such as unions, ells, tees, and crosses — both flat and vertical. Includes properties and characteristics, recommendations for use, methods of installing in formwork, and suggested specifications.

Williams Equipment & Supply Co.

**529—Concrete Curing Compounds**

Bulletin 1415 describes Horncure concrete curing compounds. Includes application methods of 30D and C, 100% resin base curing compound; 40W, white pigmented curing compound; 50D and C, wax-resin base curing compound; and 60D and C, wax-resin curing compound.

*A. C. Horn Cos.,
Divs. Sun Chemical Corp.*

**530—Dome Slab Construction**

Manual 4007 gives sizes, erection procedures, typical arrangements, design data, and typical installations for this new method of forming "waffle type" two-way dome slab construction with one-piece forms especially designed for exposed ceiling construction. Gives features, removal procedures, and outlines services. *Ceco Steel Products Corp.*

**531—Duct Floors**

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development which provides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Steel Reinforcing Institute.

**532—Structural Bolts**

Catalog describes Lamson high strength bolts for buildings, bridges, towers, and other applications, that give maximum holding power. Bolting principles, ordering data, prices are included. Bolt is distributed by 20 U. S. Steel Supply Division Steel Service Centers in key locations throughout the country.

Lamson & Sessions Co.

**533—Masonry Reinforcement**

All new 1959 Sweet's brochure now available. AA Wire Products Company, manufacturers of masonry reinforcement and masonry ties, announce that the all new 1959 Sweet's brochure is now available. The new brochure features design drawings, photographs of installations, and suggested guide specifications. *AA Wire Products Co.*

**534—Arc Welding**

Reprint of papers from proceedings of National Engineering Conference of American Institute of Steel Construction. Discussion of current practices for most economical design through efficient use of steel and most economical fabrication through modern welding techniques.

*James F. Lincoln
Arc Welding Foundation.*

**535—Duct Systems**

Bulletin 491 contains drawings, part numbers, and photographs of the three Spang duct systems for power, phone, and intercom. Underfloor duct (for regular slab construction), headerduct (for cellular floors), and industrial duct (large capacity for heavy requirements in phone and intercom systems).

National Supply Co.

**536—Steel Rope**

This publication contains information required for selection and preparation of specifications for wire, strand, and rope used on guyed structures and suspended systems of all kinds, except major suspension bridges. Both standard and special fittings for use with bridge strand and bridge rope are illustrated.

John A. Roebling's Sons Corp.

**537—Rubber Control Joints**

Four-page bulletin describes *Rapid* wide flange and *Rapid* regular rubber control joints for use in masonry walls. Included are features, advantages, physical properties, general specifications. Line drawings show both types with dimensions, also method of application are included in this bulletin.

Dur-O-wal

**538—Perforated Metals, Screens**

Hendrick general catalog, 135 pages, cross indexed, provides detailed descriptions of perforated metals, screens, and fabricated metals. Completely illustrated. Contains lists of sizes and styles, engineering data and useful tables of gauges, decimal thickness and weights. Ordering information and specifications.

Hendrick Manufacturing Co.

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DIRECTORY OF ADVERTISERS' LITERATURE

STRUCTURAL MATERIALS and EQUIPMENT continued



539—Wire Rope

Book of 44 pages, "The Right Rope for the Job," gives recommendations for specific constructions of Tiger Brand wire rope most commonly used on individual types of equipment. Different types of wire ropes are illustrated with cutaway photos. Specifications given. *American Steel & Wire Division, U. S. Steel Corp.*



540—Curtain Wall Panels

Bulletin 1727 announces and describes a new insulated curtain wall panel for industrial and commercial buildings. *Butler Monopanl* is the first factory-insulated panel that is factory cut to fit a pre-engineered structural system. Exclusive double tongue-and-groove design makes it automatically self sealing. *Butler Manufacturing Co.*



541—Steel Wall Panels

Catalog 243-a describes a new line of steel wall panels with a bold deep-shadow exterior configuration. Panels, offered with prime coat of baked-enamel over Bonderized steel, permit freedom of color choice in field painting of industrial and commercial buildings. General erection details are given. *Inland Steel Products Co.*



542—Expansion Plates and Bushings

Manual 55 contains complete information, technical data, and specifications about self-lubricating expansion plates and bushings for bridges, buildings, refinery equipment, chemical processing equipment, high temperature, missile and atomic energy applications. Fully illustrated with photographs and diagrams. *Merriman Bros., Inc., Lubrite Division.*



543—Inter-Locked Floor Grating

Bulletin 1107C describes the complete line of Dravo welded and inter-locked floor grating and stair treads and armoring and T-bar flooring. Also included are pertinent dimension and load tables for both steel and aluminum alloy. Patterns in grating, stair treads, armoring, and T-bar flooring illustrated. *Dravo Corp.*



544—Steel Stair Treads

Tread-Grip steel stair treads combine strength of construction with safe, non-slip footing, according to four-page bulletin HTP2130. This brochure describes such features as A. W. Algrip nosing, electroforged and welded construction, and twisted cross bars. Included are detail drawings and dimensions. *Horace T. Potts Co.*



545—Steel Base for Floors

Catalog BFg-594, revision of BFg-584, describes *Corruform* and *Tufcor*, high strength permanent steel base for concrete floors and roof slabs in new patterns and sheet lengths. Photos show installations and installation procedures. Shows section properties, load tables, accessories, and suggested specifications. *Granco Steel Products Co.*



546—Expanded Metal Partitioning

New catalog describes *Globe Safe-Gard* expanded metal partitioning with exclusive *Quick-Erect* patented fittings for easy method of guarding conveyors and machines and for all in-plant partitions. Catalog shows method of erection of prefabricated panels, full range of sizes available, and complete engineering data. *Globe Co.*



547—Machinery Grout

New machinery grout five times stronger than concrete offers unique combination of oil and chemical resistance, excellent bond to metal, high compressive and tensile strength. It is fast-hardening and nonsetting. No. 648 Grout is especially recommended for permanently seating machinery subjected to severe conditions. *Ceilcote Co., Inc.*



548—Insulating Concrete

New bulletin C11-1959 describes Permalite insulating concrete for roof decks and floor fills. Specifications for mixing and application are given. General characteristics of *Permalite* concrete are also discussed. Engineering data, which includes safe uniform loads and physical properties, on roof deck systems. *Great Lakes Carbon Corp.*



549—Grouting Techniques

Report 103 is the latest in a series of Intrusion-Prepakt special reports on vital construction services. Explains 19 distinctly different applications of I-P grouting techniques; both cement and chemical. Included is a paper on stabilizing a compressor foundation and a reprint on correcting a settling storage tank. *Intrusion-Prepakt, Inc.*



550—Glass Lined Smokestacks

Bulletin SS-202A describes *Permaglas* smokestacks, protected against corrosive flue gases. Features include longer life, low maintenance, lightweight, and easy installation. Chart shows how *Permaglas* stacks cost less over a period of years. Special *Permaglas* sections, smokestack accessories, and typical installations. *A. O. Smith Corp.*

STRUCTURAL MATERIALS and EQUIPMENT continued

**551—Asbestos Honeycomb Partitioning**

Catalog sheets containing information on Nicolet's asbestos honeycomb partitioning are available. Results of tests made in accordance with accepted procedures give weight, compressive strength, water absorption, moisture absorption, and heat loss. Two types available, Type I for interior and Type X for exterior.

Nicolet Industries, Inc.

**552—Flooring, Grating and Treads**

General grating catalog F-400 contains illustrations, descriptions, and complete engineering data on grating flooring, treads, and floor armoring (riveted, presslocked, and welded types). Irving grating is safe, durable, fireproof, ventilating, clean, and economical for industrial and power plant flooring and stairways.

Irving Subway Grating Co., Inc.

**553—Colored Steel Panels**

A new color booklet introducing Alcoa's *Alumalure* colors, eleven special baked enamel finishes on all sheet products. Swatches of actual enamel shown. Five of the colors contain aluminum pigment, for a rich metallic effect. Also included are application suggestions and descriptive materials.

Aluminum Company of America.

**554—Underground Concrete Conduits**

Folder describes three solid, load carrying integrally waterproofed insulating concrete conduits for underground pipe insulation. The design engineer can choose the most economic for the particular job. CTC, air testable-government approved Z-Crete, vented and drained b-t-u-water resistant monolithic concrete.

Concrete Thermal Casings, Inc.

**555—Industrial Doors**

Sixteen-page catalog describes the types of doors manufactured and installed for industrial building and aircraft hangar installations. Included are canopy type, motorized slide, turn-over, and vertical lift doors. Doors such as for crane entrances and the *Byrna-perture* for hangars are also described and illustrated.

Byrne Doors, Inc.

**556—Shingles and Siding**

Full-color catalog illustrates K & M non-corroding, nonrotting asbestos-cement roofing shingles; fluted and ribbed decorative panels; Apac, Linabestos, and Sheetflextos wallboard; corrugated asbestos roofing and siding; building-sewer pipe. Durability, attractive colors, fire-safety of asbestos-cement are stressed.

Keasbey & Mattison Co.

**557—Precast Concrete Crossing Slabs**

Bulletin X-541 gives complete information on Permacrete precast concrete crossing slabs. These edge-armored slabs provide smooth riding surfaces with greater safety and eliminate constant maintenance of railroad grade crossings. Widely used on crossings throughout industrial plant properties.

Permacrete Products Co.

**558—Corrugated Steel Sheeting**

Catalog SH-4658 describes Armco light-weight corrugated steel sheeting for controlling movement of soil or water. Two types available, interlocking and flange type. Includes physical properties, driving data, wales and struts, and other useful information. Typical applications are pictured.

Armco Drainage & Metal Products, Inc.

**559—Silicone Based Paint**

Bulletin 7-904 shows how structures and equipment can be protected by silicone-based paints up to 100% longer before refinishing is necessary. Case histories demonstrate resistance to weathering, corrosion, and increased heat stability. List of silicone-based paint producers is included.

Dow Corning Corp.

**560—Welded Steel Grating**

New eight-page illustrated bulletin describes Gary welded steel grating and treads. Has easy-to-use table of safe loads, weights and symbols, and panel widths. Included is data on fastening devices illustrated by drawings. Information on specifying grating and treads.

*Rockwell-Standard Corp.,
Grating Division.*

**561—Concrete-Filled Columns**

Concrete-Filled Columns: complete illustrated literature on pipe columns, square and rectangular tube columns, including safe loads, physical properties, and sample computations. Most fire-resistant, nonfire-proof column made, your key to better, safer construction. Types of columns and connections shown.

Tubular Products, Inc.

**562—Aluminum Grating**

Eight-page bulletin on aluminum grating. Various types of gratings are illustrated. Included are detailed drawings and tables of safe loads for Roll-Lock multi-purpose aluminum grating, pressure-lock aluminum grating, and riveted aluminum grating. Also included are details on aluminum stair treads.

Kerrigan Iron Works, Inc.

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STRUCTURAL MATERIALS and EQUIPMENT continued



563—Exposed Beam Roof Deck

Bulletin describes Tectum roof deck material for exposed beam construction. Various features are illustrated and described. Included are acoustical form plank, side-wall insulating panels, suspended acoustical ceilings, roof tile, and roof plank. Diagrams show construction and complete specifications are given.

Tectum Corp.



569—Underfloor Electrification

Manual 3011-A outlines a new method of underfloor electrification using the top chord of a newly designed steel joist for electrical raceways. Gives details and outlines method of obtaining underfloor electrification economically. Pictures show step-by-step installation of accessories and use procedures.

Ceco Steel Products Corp.



564—Metal Buildings

General catalog BD-958 describes the Parkersburg line of versatile metal buildings. Features include weather-tightness, rigidity, and flexibility. Designed with future expansion in mind. These features combine economy and quality. All types of buildings are shown from tool sheds to factories. Accessories, details.

Parkersburg Rig and Reel Co.



570—Bearing Bolts

Engineering, ordering data on new Lamson high strength bearing bolts for buildings, bridges, towers, and other applications. Bolt has highest shear strength, greatest resistance to slip of all structural bolts. Distributed by 20 U. S. Steel Supply Division Steel Service Centers throughout the country.

Lamson & Sessions Co.



565—Masonry Wall Reinforcement

This four-page bulletin is printed in two colors and describes Dur-O-wal masonry wall reinforcement. Included are features, advantages, physical properties, and general specifications. Information on cavity wall construction, rod deformation, bonding, and report of tests are also contained in this bulletin.

Dur-O-wal.



571—Wire Rope Catalog

A complete basic catalog for selecting wire rope for any use. Cross sections of different types of rope show construction. Rope diameters, breaking strength, and weight are given for all classifications. Well illustrated showing different uses. Wire rope fittings are illustrated.

American Steel & Wire Division,
U. S. Steel Corp.



566—Grilles

A 132 page handbook indexed for quick reference for the consulting engineer. Over 100 grille and register designs are shown in scale drawings, with photographs of grille sections in actual size. Complete details of dimensions and perforations. Contains both standard and exclusive Hendrick patterns.

Hendrick Manufacturing Co.



572—Revised Welding Symbols

A condensed summary of standard American Welding Society revised welding symbols. Symbols denote type of welds to be used and welding technique for making joints to satisfy strength and service requirements. Bulletin also contains electrode specifications and joint design suggestions. Practical applications.

Lincoln Electric Co.



567—Service Fittings

Bulletin 493 illustrates design features, simplicity of assembly of new Spang service fittings, suitable for use with underfloor distribution systems of any manufacturer. Covers individual power and phone fittings and includes illustrations of linoleum pan, terrazzo holder, plus part numbers, and ordering information.

National Supply Co.



573—Floor Gratings

Bulletin covers an improved conception for the installation of floor gratings, using the single-span divider-bar, combined with Borden's Type K reversible grating. Simplifies maintenance as well as installation. Bulletin pictures and describes installation at the new Public Service Generating Station, Linden, N. J.

Borden Metal Products Co.



568—Vinyl Coated Corrugated Steel

Catalog V-91 describes a new vinyl protected corrugated steel — Granco Vin-Cor. Used in industrial and commercial buildings of all types. Available in nine standard colors and a wide selection of gages and patterns. Full color catalog gives color selection, section properties, typical details, and specifications.

Granco Steel Products Co.



574—Seals and Gaskets

Four-page bulletin SG-659 covering complete line of Weathertite seals for various types of control joints in block constructed walls. It also covers masonry gaskets of nonabsorbent elastomer for use between sill and coping stones, brick or stone wall panels, and masonry and structural steel members.

Williams Equipment & Supply Co.

STRUCTURAL MATERIALS and EQUIPMENT continued

575—Metal Buildings

All-new general line Catalog 1671 for Butler buildings includes complete information on both all-metal and system buildings for commercial, industrial, and community use. Illustrates and describes rigid frame construction for both standard and low-pitch roofs, describes cover panels and construction features.

Butler Manufacturing Co.

**576—Detention Windows**

Catalog D-59 describes the complete Bayley line of especially designed detention windows for penal and mental institutions. Shown are types suited to various degrees of detention and individual preferences as to fenestration and ventilation. Complete details of design, construction; specifications.

William Bayley Co.

**577—Duct Floors**

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development which provides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Steel Reinforcing Institute.

**578—Steel Buildings**

Catalog 530 describes a complete line of steel buildings for commerce and industry. Twenty pages of full color show buildings available with clear span up to 120 feet. Illustrations show how steel panels combine with other exterior materials to give pleasing appearance. Construction details. Accessories listed.

Inland Steel Products Co.

**579—Non-Shrink Mortar**

Bulletin E-38 describes Emeco non-shrink mortar, its uses and advantages. Large drawing shows various applications in new construction. Numerically keyed notes give further information on that particular application. Because of its dimensional stability Emeco is widely used in repair of concrete structures.

Master Builders Co.

**580—Silicone Water Repellent**

Bulletin 6161 describes Dehydrantine No. 22, a silicone water repellent for masonry walls. Contains complete description, purpose and method of application for this water repellent, which forms a barrier against water and permits masonry to breath.

*A. C. Horn Cos.,
Divs. Sun Chemical Corp.*

**581—Rolling Doors**

Bulletin 101, 36 pages, is a complete catalog of the many types of doors made by Kinnear. It gives information on the types of operations, both manual and electrical; elevation drawings; mounting methods for various applications and locations; specifications; and explains special construction features of these doors.

Kinnear Manufacturing Co.

**582—Wire Reinforcement Study**

New studies conducted by Armour Research Foundation agree with previous reports that the replacement of header courses by wire reinforcement *correctly designed* does not reduce the transverse strength of a wall. In fact there is an increase in strength of about 12 percent. Booklet contains illustrations of use.

AA Wire Products Co.

**583—Scaffold Shoring**

Bulletin BP-10 describing Beatty scaffold shoring is composed of 6 pages and printed in 2 colors. Contains diagrams, shoring data tables, and description of frames. Wing-nuts and studs are replaced with labor-saving patented snaplocks. Various applications are pictured. Also described is Pecco shoring.

Beatty Scaffold, Inc.

**584—Concrete Acoustical Ceiling**

New catalog AT-58 gives installation data and detail drawings for use of acoustical and troffer forms for concrete joist and slab construction with acoustical ceilings and recessed lighting. Saves time, materials, and labor costs. Produces an attractive and very practical acoustical ceiling.

R. C. Mahon Co.

**585—Concrete Tensioning Materials**

Catalog PC-936 shows sizes, weights, strengths, and typical load-elongation curve of uncoated stress-relieved strand for pretensioned bonded prestressed concrete. Properties of galvanized strand and uncoated stress-relieved wire for post-tensioned design are listed. End fittings, bearing plates are illustrated.

John A. Roebling's Sons Corp.

**586—All Purpose Steel Buildings**

Bulletin 57-I-112 describes the new Stran-Steel *Stran-Master*, the low cost, all steel, all purpose building for industrial and commercial uses. Various types of buildings pictured, with dimensions shown. Quality features are described and pictured. Erection procedures are explained and illustrated.

Stran-Steel Corp.



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WATER TREATMENT and WASTE DISPOSAL



587—Upflow Clarifiers

In bulletin 5811 models C, CP, CPS, P and CF of General Filter Company's upflow clarifiers are described and illustrated. Flow charts and important features, essential to economical and efficient operation, are included. Typical contralto industrial, utility, and municipal installations are shown and described.

General Filter Co.



588—High-Flow-Rate Clarifier

Bulletin CL-158 describes the *Illco-Way* continuous high-flow-rate clarifier, an upflow coagulator design that is adaptable to a wide variety of water and waste treatment applications, including lime-soda dealkalization, removal of iron, color, turbidity, organics, silica, and chemical waste treatment.

Illinois Water Treatment Co.



589—Sewage Lift Stations

This 100-page manual on factory-built sewage lift stations contains bulletins, selection charts, diagrams, installation data, and specifications for pump-type or pneumatic ejector lift stations. Detail bulletin on new "Non-Clog" sewage pumps and list of more than 1000 S&L stations in operation across the nation.

Smith & Loveless, Inc.



590—Supplying Water

Twenty-four page booklet entitled "Supplying Water" describes the unique Ranney methods of supplying more clear water to industry and municipalities. Valuable information is included on horizontal collectors, infiltration galleries, *Vertube* wells, Ranney intakes, and new dewatering process.

Ranney Method Water Supplies, Inc.



591—Trash-Sewage Pumps

Bulletin on nonclogging, high and dry, open impeller, trash-sewage pumps. These self-priming centrifugals are available in 3, 4, and 6 in. sizes. Feature the ability to handle solids up to 1½, 2, and 2½ inches in diameter. These pumps are useful in dewatering, sewage, and industrial sump applications.

Gorman-Rupp Co.



592—Diatomite Pressure Filters

Bulletin 2-323 covers the line of Bruner diatomite pressure filters for swimming pools. Standard filters are available in sizes from 12 to 672 sq ft. Features include a septum with interlocking plastic disc core and plastic cloth sleeve. Schematic diagrams and comparison charts for diatomite and sand filters.

Bruner Corp.



593—Swimming Pool Filtration

Catalog 803, 32 pages, describes equipment specially designed for municipal, club, school, and commercial swimming pools of moderate to large size. Gives data on everything for the pool including inlet and drain fittings, filtration, recirculation, chlorination, lighting, cleaning, diving equipment, and accessories.

Elgin Softener Corp.



594—Ion Exchange Units

Sixty-page manual Z-5 explains ion exchange water conditioning processes, the resins and equipment used, quality of water produced, and typical costs involved. Designed as a practical handbook to aid engineers in proper selection and operation of ion exchange units in water conditioning applications.

Nalco Chemical Co.



595—Diatomite Water Filter

Bulletin 670 describes a new type heavy duty diatomite water filter for plant supply water or for filtration of re-use water without appreciable heat loss. Complete description of diatomite filtration, including engineering specifications. Also gives flow rate charts and table of capacities.

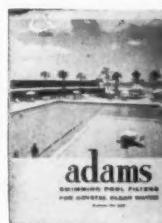
Sparkler Manufacturing Co.



596—Chlorinators

This 16-page pocket size booklet describes Wallace & Tierman's new V-notch chlorinators. It explains what they are, how they work, and the type of automatic control possible with this chlorinator. The booklet also shows the full line of chlorinators and lists chlorinator capacities. Major features illustrated.

Wallace & Tierman Inc.



597—Swimming Pool Filters

New 24-page technical bulletin for consulting engineers on swimming pool filters for municipal, public, and institutional pools. Contains typical installations, cross-section and operational drawings, charts, and factual comparison. This manufacturer does not offer a filter for backyard type pools.

R. P. Adams Co., Inc.



598—Automatic Backwash Sand Filter

Bulletin 46-A describes the Hardinge automatic backwash sand filter. This filter has a compartmented sand bed and traveling backwash mechanism which cleans one compartment at a time while the rest of the filter bed operates normally. Particularly suited for industrial and municipal water supply.

Hardinge Co., Inc.

WATER TREATMENT and WASTE DISPOSAL continued

**599—Water Treatment Equipment**

Bulletin E describes the automation of ion-exchange and water treatment equipment. A suggested specification is included, together with typical illustrations and descriptions of important design features. Automatic control systems described are adaptable to any automatic valve sequencing operation.

Illinois Water Treatment Co.

**605—Sewage Treatment Plant**

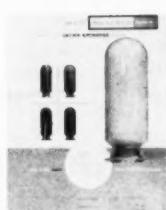
This data manual on the S&L "Oxigest" sewage treatment plant contains notes on design, engineering data, specifications, and installation instructions plus lists of accessory equipment. Now 27 standard sizes; factory-built units for small subdivisions, schools, motels, factories in need of dependable sewage treatment.

Smith & Loveless, Inc.

**600—Water Stills**

Catalog "H" describes Barnstead's complete line of water stills specially designed for hospital use. In capacities of from $\frac{1}{2}$ gallon to 1000 gallons per hour and operated by steam, electricity, gas, and kerosene. Other models for double and triple distillation are also described in this useful catalog.

Barnstead Still & Sterilizer Co.

**606—Cation Exchange Resin**

Bulletin Z-7 describes new Nalcite HCR-W stress-free cation exchanger. Performance data covering three years of operation is given to support claims of high physical stability. Advantages of HCR-W for hot lime-zeolite and demineralization applications are discussed. Illustrated in natural color.

Nalco Chemical Co.

**601—Pneumatic Sewage Ejectors**

Municipal pump and lift stations will give uninterrupted service when equipped with B-S pneumatic sewage ejectors. Available in capacities of 30 to 500 gpm for discharge heads up to 150 ft, these single and twin units eliminate complex piping, screens, shredders, and impellers. Catalog S-55 fully describes them.

Condenser Service & Engrg. Co., Inc.

**607—Supplying Water**

Ranney's revised 24-page booklet entitled "Supplying Water" describes the unique Ranney methods of supplying more clear water to industry and municipalities. Valuable information is included on horizontal collectors, Vertube wells, Ranney intakes, and Ranney's new dewatering process.

Ranney Method Water Supplies, Inc.

**602—Dicalite Diatomite Filters**

Bulletin BW-13 covers the use of Dicalite diatomite filter aids in municipal water supply and swimming pool filtration. The 16-page booklet includes diagrams which show the basic characteristics of diatomite filtration systems and discusses both cost and operating factors in some typical applications.

Great Lakes Carbon Corp.

**608—Industrial Diatomite Filters**

Bulletin 2204-R covers a wide range of industrial Diatomite filters, both standard models and custom engineered. Illustrated and described are horizontal plate filters and vertical plate filters. Also shown are Sparkler filters for specialized uses. Cutaway photographs show construction. Specifications given.

Sparkler Manufacturing Co.

**603—Liquid Separators**

Bulletin WC-121 describes the Graver Hi-Sep dialyzer. The separation and recovery of acid, alkali, and salt liquors, which until now has been limited to laboratories and one or two industrial applications, now is possible for general use. Includes design features, operation, applications, detailed drawings.

Graver Water Conditioning Co.

**609—Filter Plants**

Filter plants for the removal of iron, manganese, taste, odor, and gas are described in a new General Filter bulletin. Various problems are listed and answers given. Four basic treatment methods are described and graphically shown in drawings. Actual installations in all parts of the country are shown.

General Filter Co.

**610—Treatment Tanks**

Bulletin AET-59 contains full-color illustrations of water and effluent treatment tanks. They are steel-reinforced concrete structures faced on both sides with vitrified tile laid with corrosion-resistant mortar. Tanks are exceptionally attractive in appearance. Included are drawings showing wall construction.

Stebbins Engineering & Mfg. Co.

**610—Diatomite Filters**

Bulletin 804 describes new diatomite filter elements. Elements of woven wire and stainless steel coil support diatomite filter media and provide unrestricted flow. "Breather" action of elements cause instant release of spent diatomite and swirl flushout assures its complete removal. Sand filters also described.

Elgin Softener Corp.

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Index of Advertisers' Literature

Manufacturer	Item No.	Manufacturer	Item No.	Manufacturer	Item No.
AA Wire Products Co.	533, 582	Electric Machinery Mfg. Co.	120, 161	Ohio Injector Co.	339, 372
ACF Industries, Inc., W-K-M Div.	324, 374	Electric Products Co.	115, 160	Onan & Sons, D. W.	110, 189
Acme Industries, Inc.	32, 89	Electric Storage Battery Co.	113, 176	O. Z. Electrical Mfg. Co.	111, 190
Adams Co., R. P.	483, 597	Elgin Softener Corp.	593, 610	Parkersburg Rig & Reel	527, 564
Advance Transformer Co.	267	Emhart Mfg. Co. (Maxim Div.)	397, 442	Pass & Seymour	151, 177
Aerofin Corp.	69, 202	Enjay Co., Inc.	450	Peerless Electric Co.	67, 91
AeroTec Corp.	7, 433	Erie City Iron Works	391, 438	Penn Ventilator	28, 105
Aerovent Fan Co., Inc.	25, 106	Everlasting Valve Co.	342, 370	Perlite Dept., Great Lakes Carbon Corp.	548, 602
Agat Mfg. Co.	5, 18	Executive, Inc.	500, 513	Permacrete Products Corp.	557
Air Devices, Inc.	39, 101	Fairbanks Co.	328, 377	PETRO, Div. of Iron Fireman Mfg. Co.	396, 428
Air Preheater Corp.	411, 454	Federal Pacific Electric Co.	#	Petrometer Corp.	219, 236
Allen Mfg. Co., W. D.	191, 196	Fiese & Firstenberger Mfg. Inc.	464, 488	Philadelphia Gear Works, Inc.	330, 378
Allen-Bradley Co.	140, 227	Fischer & Porter Co.	224, 243	Pittsburgh Corning Corp.	252, 255
Allis-Chalmers Mfg. Co.	186, 193, 419, 426, 448, 458	Fisher Governor Co.	338, 382	Planet Corp.	214, 293
Alumnum Co. of America	553	Fitzgibbons Boiler	50, 90	Porta Trace, Inc.	313, 318
American Air Filter Co., Inc.	1, 15	Flexitalllic Gasket Co.	400, 436	Potts Co., Horace T.	544
American Cast Iron Pipe Co.	341, 383	Fly Ash Arrestor Corp.	12, 404	Powell Co., Th. Wm.	335, 381
American Engrg. Co.	405, 437	Fuller Co., The	291, 424	Powers Regulator Co.	220, 247
American Gas Association	65, 197	Fyr-Fyer Co.	194	Pritchard Co., of California	38, 81
American Gilsonite Co.	251, 258	General Cable Corp.	319, 367	Radio Corp. of America	499, 515
American Hoist Pacific Co.	279, 303	General Electric Co.	107, 124, 134, 175, 179	Ranney Method Water Supply, Inc.	590, 607
American Marsh Pumps, Inc.	469, 491	General Filter Co.	587, 609	Ray Burner Co.	407
American Standard, Industrial Division	59, 421	Globe Co., The	149, 546	Recold	27, 87
American Vitrified Products Co.	344, 371	Golden-Anderson Valve Specialty Co.	326, 388	Reliance Gauge Column Co.	226, 233
Ames Iron Works, Inc.	398, 440	Goodyear Rubber Co.	446, 459	Republic Steel Corp.	122, 200
Ammerman Co., Inc.	103	Gorman-Rupp	475, 591	Reznor Mfg. Co.	46, 100
AMP, Inc.	123	Goulds Pumps, Inc.	461, 482	Richmond Engineering Co.	201, 449
Anaconda Wire & Cable Co.	129, 184	Granco Steel Products Co.	545, 568	Ric-wil, Inc.	353
Anemostat Corp. of America	58, 99	Graver Tank & Mfg. Co.	280, 300	RLM Standards Institute, Inc.	260, 272
Appleton Electric Co.	108, 347	Graver Water Conditioning Co.	414, 603	Robbins & Myrs, Inc.	40, 93
Armco Drainage & Metal Products, Inc.	206, 558	Gustin-Bacon Mfg. Co.	254, 257	Roberts & Schaefer Co.	289, 453
Armstrong Machine Works	33, 358	Guth Co., Edwin F.	264, 276	Rockwell Co., W. S.	343, 379
Arrow-Hart & Hegeman Electric Co.	125, 156	Hamilton Kent Mfg. Co.	320, 368	Rockwell Standard Corp., Grating Div.	560
Asphalt Institute, The	205, 211	Hardinge Co.	451, 598	Roebling's Sons Corp., John A., ... 166, 209, 536, 585	109, 180
Auth Electric Co.	504, 510	Haughton Elevator Co.	283, 301	Rome Cable Corp.	478, 485
Automatic Switch Co.	142, 221	Haws Drinking Faucet Co.	340, 380	Roper, Geo. D. Corp., "	473
Babcock & Wilcox Co.	399, 435	Heinemann Electric Co.	130, 164	Roth Co., Roy E.	472
Barber-Colman Co.	21, 71, 97, 237	Hendrick Mfg. Co.	538, 566	Royal McBee Corp.	314, 316
Barco Mfg. Co.	334, 373	Heverdington & Berner, Inc.	296, 321	S & C Elec. Co.	159
Barnebey-Cheney Co.	3, 14	Hevi-Duty Electric Co.	137, 182	Schaub Engineering Co., Fred H.	413, 481
Barnstead Still & Sterilizer Co.	363, 600	Hills-McCann Co.	284, 306, 308, 311	Schutte & Koerting	452
Bayley Co., William	522, 576	Hubbell, Inc., Harvey	355, 465	Sier-Bath Gear & Pump Co., Inc.	310, 474
Beatty Scaffold, Inc.	523, 583	Illinois Water Treatment Co.	588, 597	Simplex Wire & Cable Co.	139, 163
Bell & Gossett Co.	19, 480	Inland Steel Products Co.	541, 578	Sims Co.	198, 425
B-I-F Industries	294, 354	International Builders Works Co.	395, 429	Smith Co., A. O.	420, 550
Bituminous Coal Institute	83, 427	Intrusion-Prepakt, Inc.	549	Smith & Loveless, Inc.	589, 605
Blonder-Tongue Laboratories, Inc.	145	Iron Fireman Mfg. Co.	401, 441	Smooth-Holman Co.	275
Borden Metal Products Co.	526, 573	Irving Subway Grating Co., Inc.	207, 552	Soiltest, Inc.	230, 239
Bruner Corp.	477, 592	I-T-E Circuit Breaker Co.	117, 121, 131, 154, 162, 165, 178, 187	Sorgel Elec. Co.	148, 181
Bruning Co., Inc., Charles	315, 317	Jeffrey Mfg. Co.	447, 457	Southwestern Plastic Pipe Co.	188, 360
Buensod-Stacey, Inc.	31, 86	Jenn-Air Products Co.	48, 76	Sparkler Mfg. Co.	595, 608
Buffalo Forge Co.	23, 98	Jerguson Gage & Valve Co.	228, 244	Speedline Stainless Steel Fittings	357
Burgess-Manning	423, 512	Kalamazoo Tank & Silo Co.	285, 299	Spencer Turbine Co.	10, 288
Burnham Corp.	43, 74	Paul Clay Co.	361	Square D Co., ... 110, 126, 141, 147, 155, 170	503, 508
Burt Mfg. Co.	64, 78	Kestaby & Mattison Co.	195, 556	Standard Electric Time Co.	604
Butler Mfg. Co.	540, 575	Kevlar Iron Works, Inc.	210, 562	Stebbins Engineering & Mfg. Co.	520, 586
Bussmann Mfg. Div.	144, 185	Kinneal Mfg. Co.	525, 581	Strom-Steel Corp.	507, 517
Byers Co., A. M.	329, 365	Kriegel Bros.	269	Stromberg-Carlson, Commercial Sound	505, 516
Byrne Doors, Inc.	555	Kohle Co.	146	Strong, Carlisle & Hammond Div., White Sew. M.	332, 386
Canton Stoker Corp.	415, 476	Kraloy Plastic Pipe Co., Inc.	153, 349	Sumo Pumps, Inc.	471
Carrier Corp.	42, 70	Kunkle Valve Co.	218, 348	Sun Chemical Corp.	529, 580
Ceco Steel Products Corp.	530, 569	Lamson & Sessions Co.	532, 570	Superior Combustion Ind., Inc.	75, 422
Cellicote Co., Inc.	455, 547	Lennov Industries, Inc.	20, 82	Sutorbilt Corp., Sub. of Fuller Co.	467, 490
Certified Ballast Mfgs.	263, 274	Leupold & Stevens Instruments	222, 238	Swartwout Co.	61, 192
Chrysler Corp., Airtemp Div.	494, 495	Liquidometer Corp.	534, 572	Sylvania Elec. Prod., Inc.	262, 278
Clarae Fan Co.	49, 88	Ludlow Valve Mfg. Co.	225, 250	Tapecoat Co.	336, 376
Cleaver-Brooks Co.	47, 456	Luzerne Rubber Co., The	321, 375	Tectum Corp.	519, 563
Climax Engine Mfg. Co.	393, 430	McDonnell & Miller, Inc.	223, 240	Temprite Products Corp.	333, 366
Clyde Iron Works, Inc.	266, 305	mcPhliben Lighting, Inc.	266, 277	Texsteam Corp.	350, 418
Cochrane Corp.	203, 409	Magnetrol, Inc.	232	Thermal Eng. Corp.	51
Colt Ventilation of America	29, 94	Mahon Co., R. C.	521, 584	Titusville Iron Works Co.	22, 77
Combustion Engineering, Inc.	24, 406	Marietta Concrete Corp.	295	Todd Shipyards Corp.	410, 434
Committee on Steel Pipe Research	45, 346	Mario Coil Co.	524, 579	Torit Mfg. Co.	9, 16
Concrete Reinforcing Steel Institute	297	Master Builders Co.	216, 362	Tranter Mfg. Co.	445, 460
Concrete Thermal Casings, Inc.	531, 577	Mercoid Corp.	594, 606	Tubular Products Co.	561
Condenser Service & Engineering Co., Inc.	204, 601	Michael Flynn Mfg. Co.	52, 102, 212	U. S. Gauge, Div. American	231, 235
Connor Engineering Corp.	6, 85	Moloney Electric Co.	66, 511	Mach. & Metals, Inc.	208, 213, 539, 571
Continental Wire Sales Corp.	116, 168	Murray Manufacturing Co., D. J.	152, 172	U. S. Steel Corp.	466, 485
Cook Lored Co.	63	Nalco Chemical Co.	54	Viking Pump Co.	351, 417
Crouse-Hinds Co.	127, 265	Nati'l U. S. Radiator Corp.	72, 104	Vogt Machine Co., Henry	133, 169
Curtis-Albrite Lighting, Inc.	273	National Supply Co.	535, 567	Wagner Electric Corp.	290, 596
Curtis Mfg. Co. (Refrigeration Div.)	57, 498	Naylor Pipe Co.	323, 387	Wallace & Ternan, Inc.	37, 246
Cyclotherm Div., Nat'l U. S. Radiator Corp.	34, 408	Neff & Fry Co.	282, 304	Weighing Components, Inc.	249, 287
Darling Valve & Mfg. Co.	352	Neo-Ray Products, Inc.	261, 270	Wei-McLain Co.	36
Day-Brite Lighting, Inc.	259, 268	Nesbitt, John J.	53, 80	Weinman Pump Mfg. Co.	463, 492
Dean Products, Inc.	199, 493	New York Blower Co.	44, 84	Western Boiler Co.	431
DeBothezat Fans Div., American Mach. & Metals	30, 96	Nagara Blower Co.	60, 497	Westinghouse Elec. Corp.	73, 114, 119, 138, 150, 158, 271, 309
DeLaval Steam Turbine Co.	470, 484	NIBCO	325, 385	Sturdiveent	55
Detroit Stoker Co.	394, 439	Nicolet Industries, Inc.	500, 551	White Diesel Eng. Div.	402, 444
Diamond Power Specialty Corp.	241, 412	Northern Blower Co.	8, 17	Whiting Corp.	281, 302
Dow Corning Corp.	157, 559	Nugent & Co., Inc.	327, 389	Wickes Boiler Co.	403, 443
Dracco Corp.	11, 298			Williams Equipment & Supply Co.	528, 574
Dravo Corp.	68, 543			Worthington Corp.	416, 479
Drayer-Hanson	41			Young Radiator Co.	242, 345
DuKane Corporation	506, 518			Zenith Electric Co.	171, 217
Dunham-Bush, Inc.	35, 496				
Dur-O-Wal Products, Inc.	537, 565				
Dustex Corp.	4, 292				
Ebc Manufacturing Co.	331, 369				
Edwards Co., Inc.	501, 514				
Edward Valves, Sub. Rockwell Mfg. Co.	337, 384				